The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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The offices of THE CHEMICAL AGE *will be closed from Friday evening, December 22, to Wednesday morning, December 27.*

Christmas

IT is once more our pleasure to wish our readers a merry Christmas and a prosperous New Year. As we approach the old festival once again there are signs that for many in the chemical industry it may, at least, be a time of less anxiety than Christmas has been for some years past. Trade is undoubtedly better. The spirit of unrest is subsiding. Unemployment is still too common, but increasing trade will presently relieve it. The threatened deadlock in the heavy chemical trade is at least deferred by the postponement for three months of the question of the reduction of wages. These may not be great movements in themselves, but they all tend in the right direction. On the whole, this Christmas will probably be the best we have enjoyed since the outbreak of the war, and though the ideal of "peace on earth, goodwill towards men" is still menaced from several quarters, there remains enough to make the British people proud of their land and thankful that they live in it.

This is the fourth Christmas THE CHEMICAL AGE has celebrated, and each has marked a steady advance, for which our sincere acknowledgments are due to readers, advertisers and contributors. Next week, in our Annual Review Number, some survey will be made of the developments of the closing year. Each of our previous Review Numbers has been welcomed as constituting a volume of contemporary history which no other journal had even attempted to supply. Next week's issue, we believe, will be recognised as the best of the series, and it is no small satisfaction to have gained the support of so distinguished a school of contributors. The special features will comprise a carefully compiled retrospect of the chief events in chemical industry during 1922, a review of the dyestuffs industry by Sir William Alexander, a survey of the nitrogen industry by Dr. E. B. Maxted, an article on chemical engineering progress by Professor Hinchley, an account of the developments in heavy acids and alkalis by Mr. P. Parrish, a careful analysis of the principal chemical and allied inventions by a patent expert, a note on the position of the natural fertiliser industry, and a detailed examination of the chemical trade movements of the year by a well-known member of the firm of Chas. Page and Co., together with short summaries of the work of the principal chemical and allied societies. Almost concurrently the first issue of *The Chemical Age Year Book, Directory and Buyers' Guide* will make its appearance, being available to subscribers on the first day of the new year. Our efforts in the past three-and-a-half years to meet a need hitherto unsupplied by existing publications have received the warmest recognition, and the best return will be an endeavour to make our service still more complete in the coming year.

Arsenic in Cocoa

THE Richmond justices on Monday fined the Home and Colonial Stores, Ltd., 40s. for selling cocoa containing one-fortieth of a grain of arsenic per lb. Rowntree and Co., Ltd., as manufacturers of some of this cocoa, were charged with aiding and abetting and were fined £20 and 50 guineas costs. The sample sold and analysed was a blend of seven different brands of cocoa. All except the Rowntree sample were found to be pure; that sample contained one-tenth of a grain per lb., whereas the safe limit of arsenic in food, as fixed by a Royal Commission, is one-hundredth of a grain. The comparative lightness of the fine on the manufacturing firm indicates clearly that they were exonerated from any wilful or culpable negligence. At the same time the liability of any firm manufacturing so widely used an article as cocoa is onerous, and the standard of responsibility can hardly be placed too high. Nor can any consideration of private trade interests be allowed to weigh against the public safety.

One ethical point of some interest occurs in the case. The discovery that some of their cocoa contained traces of arsenic was made last July by the defendant firm. It was a great shock. They promptly sacrified 350 tons of cocoa, instituted a new test, and as a result were able to declare that every ounce of their output from August 1 was quite pure. But in the meantime a quantity of the affected cocoa had been put on the market and could not be recalled. What should a firm do in such circumstances—make a frank disclosure of the fact, regardless of consequences, or let matters alone? Honestly believing that the arsenic was of too small a proportion to injure anyone, the firm made no public statement as to their discovery. Their reason was that such a statement would cause an unjustifiable scare, and seriously affect the chocolate trade of the country. The justices, so far as we are aware, offered no opinion as to the right course for a firm to follow in such circumstances. Nor do we. It is one of those difficult points on which equally honest persons may choose different courses.

Two points of interest as affecting analytical tests also arise. It was admitted that the arsenic came from carbonate of potash used in making the cocoa, that the presence of arsenic in carbonate of potash had never been suspected, and that no test for arsenic was accordingly made. The chief chemist admitted in evidence that if the firm had applied the tests used by the public analyst the presence of arsenic would have been detected. The fact, therefore, that the undetected arsenic was so small a proportion was a most fortunate accident for the public, for a test which passed a small and harmless proportion might have passed a larger and dangerous proportion. The onus of guaranteeing the purity of our foods falls properly upon those who prepare them, and the tests should, as far as possible, exclude all risks. The case further illustrates the importance of the Sale of Foods and Drugs Act, and the efficiency of the analytical service for the protection of the public carried on under its provisions. Such activities as the sampling of foods are sometimes regarded as needlessly fussy and officious. The fact that official analysis disclosed an unsuspected impurity in the product of so reputable a firm as the one in question attests both the need and the vigilance of our public system of food inspection. In this case the defendants will have a certain amount of sympathy. Their good faith was never brought into question. But public security in such matters transcends all other interests.

The case recalls the scare caused in 1905 by the discovery of arsenic in beer. The late Lord Moulton was chairman of an expert committee appointed to investigate the matter, and in his "Life," noticed last week, reference is made to it. The arsenic in the beer was traced to contaminated sulphuric acid used in the preparation of the "brewing-sugar." The acid had been prepared, not from brimstone, but from pyrites (iron sulphide), and acid so prepared will as is well-known contain arsenic, unless dearsenicated by hydrogen sulphide in the usual way. "In order," Mr. Fletcher Moulton writes, "to avoid any risk, the brewing-sugar makers had always stipulated for brimstone acid, but in fact had been supplied with pyrites acid which had been freed from arsenic. The great bulk of the sulphuric acid made by the firm from whom they obtained it was used for industrial purposes, where the presence or absence of arsenic was immaterial, and this firm, forgetting that a portion was sold to brewing-sugar manufacturers, decided to omit the purification process and so save apparently needless expense. Shortly before, the brewing-sugar maker's chemists, who for many years had made routine examinations of the sulphuric acid for arsenic without ever finding any, had decided to drop the test. By this strange coincidence (for it was nothing more) the arsenic was enabled to find its way into the beer." In this case Mr. Fletcher Moulton estimates the saving of omitting the purification process at about £100 per annum, whereas, apart from the suffering to the patients, the financial consequences were "appalling." Even where no question of culpable negligence arises in such cases, they go to emphasise the indispensable importance of the chemist's function and the economy of liberal expenditure upon it.

Nitrogenous Fertiliser Prospects

It has been estimated that nearly one-half of the total money expended on manures goes in paying for nitrogen, and of all plant food constituents this element must, perhaps, be considered the most important, for the reason that it has the most direct and immediate effect. Although a good deal of nitrogen is still employed in the organic form, we are in this country mainly concerned with materials in which it exists in the form of ammonia or as a nitrate. Sulphate of ammonia must, of course, continue to be considered our most important fertilizer; for, apart from any specific merits it possesses, it is a home-produced material of which we manufacture more than sufficient to meet our own present-day demands. On the other hand, Chilean nitrate has for many years been regarded with considerable popularity, so that when it comes to discussing the fertilizer situation attention must primarily be given to nitrate of soda and sulphate of ammonia. A factor of major importance is the relative cost per unit of nitrogen contained in the two materials, and with nitrate at its present price (about £12 10s. per ton) and sulphate of ammonia ranging, according to quality, from £15 10s. to £16 13s. per ton, it may readily be seen that there is little difference so far as the actual cost of nitrogen is concerned.

The markets in both materials have been particularly interesting during the past year, and nitrate prices have been materially affected by the considerable surplus available and the tendency for large shipments to come forward. So far as sulphate of ammonia is concerned the position is bright; and, although there undoubtedly prevails something approaching depression in agricultural circles, we are inclined to think that consumers would be ill-advised to repeat their attitude of last year and hold off in the hope of coming in at the last moment at lower figures. Home farmers are, perhaps, inclined to overlook the fact that they receive the most considerate treatment at the hands of the British Sulphate of Ammonia Federation, as is instanced by the fact that export prices are some £3 to £4 above figures for home con-

sumption. As yet, prices for the New Year have not been announced, but it will be a matter for surprise if no advance occurs. Resources are still distinctly on the short side, and this in spite of the fact that just at the moment the home trade is more or less stationary. However, there are indications that there is more material wanted for export than is actually available, and the price is firm at £19 to £20 per ton.

One does not have to look far for the reasons which account for the strength of the export trade. Firstly, it may be recalled that the sulphate exported this year is little more than one third of the pre-war quantity, while the labour disputes in America have had a marked effect in easing competition. With regard to the future it is more than ever imperative that every effort should be made to increase production in this country. The output is still below the normal, and next year it is calculated that America (who, by the way, produced only about 100,000 tons per annum some ten years ago) will probably have a quarter of a million tons available for export. Our own production has, of course, suffered recently from the disappointing conditions prevailing in iron-producing centres and the consequent slackness in the metallurgical coke industry. If predictions can be relied upon, however, we should witness some considerable increase in supplies in 1923.

Gold from Oil Shales

FOR a year or more there have been in circulation rather cryptic statements which have given the impression that not only gold, but platinum, silver and other precious metals, have been discovered in, and successfully extracted from, oil shales. These reports, however they originated, have given rise to a good deal of misunderstanding, particularly in America, where the matter is of far greater concern than over here. The correctness of the statements has from time to time been questioned from responsible quarters ; and the matter has now been more or less cleared up by Mr. Thomas Varley, of the United States Bureau of Mines. Mr. Varley investigated the process in operation at one typical mill, where the decarbonised shale was treated with hot solutions in tanks equipped with amalgamation plates. The material was ultimately treated by cyanidation, and the solutions from the cyanide leaching were passed through zinc boxes, where any gold or silver which might have been taken into solution would be precipitated. Mr. Varley was shown several pieces of so-called gold, but under the nitric acid test this was found to be practically all copper. Investigations were, however, continued with samples of shale at the Bureau's laboratory, and after an exhaustive examination it was concluded that, at any rate so far as the type of shale dealt with was concerned, under no conditions could the recovery of gold be made commercially feasible, owing to the extremely small quantity of this metal contained in the shale. In fact, the decarbonised shale assayed only 0.03 oz. of gold per ton.

Unless the ordinary classes of shales differ considerably in their gold-bearing properties, it must be concluded that even though gold is present in commercial quantities, treatment by cyanidation and chlorination will not recover a sufficient quantity to make the proposition commercially feasible. Certain samples of shale showed a content of nearly 4 per cent. of iron, and the presence of pyrites was clearly demonstrated. The latter might be more or less responsible for the small amount of gold found in the shale, and although assays on several shales did not indicate any direct relation between the iron content and the gold content, it seems far more reasonable to expect that should gold at any time be found, it would be more likely to be found in the sandstone seams between the layers of shale. The form in which the gold exists is, however, an open question, and as the amount involved is so small, it would scarcely be worth the time spent on elucidating the matter. Mr. Varley suggests that it may occur in the "flour" form as very finely-divided particles. On the other hand, the presence of pyrites suggests that this may be of the gold-bearing variety. Either or both theories are logical, but as a commercial proposition, the whole matter may be dismissed until someone discovers a shale deposit where the process of concentration has been carried out by nature to a more alluring degree.

Points from Our News Pages

Affinity and atomic structure are dealt with in a special article by Professor J. R. Partington (p. 884).

In the seventh of his CHEMICAL AGE letters from America, Mr. F. E. Hamer gives his impressions of the Du Pont organisation (p. 887).

A new class of acid dyes known as "sulphato" dyestuffs formed the subject of a paper at a meeting of the Society of Dyers and Colourists (p. 889).

The Referee appointed under Part I. of the Safeguarding of Industries Act has decided against the complainants in the oxalic acid case (p. 889).

Some directions in which the close co-operation of the chemist and the metallurgist is necessary were indicated by Dr. C. H. Desch in a lecture before the Chemical Society (p. 890).

A detailed examination of the Board of Trade Returns for November shows a fairly general increase in our exports of chemicals (p. 890).

According to our London Market Report, markets have been surprisingly active, with a much better export demand and quite a substantial volume of business (p. 898).

Our Scottish Market Report states that wood distillation products are in demand, with methyl alcohol in very short supply (p. 901).

The Calendar

Jan. 5	Society of Chemical Industry (Manchester Section). Short papers by members. 7 p.m.	16, St. Mary's Parsonage, Manchester
8	Institution of Rubber Industry. "Plantation Rubber." P. J. Burgess.	London.
8	Society of Chemical Industry (London Section). Joint meeting with the Biochemical Society. "Micro-organisms and their Application to Industry and Research." 5-7 p.m., 8.15-10 p.m.	Institution of Mechanical Engineers, Storey'sGate,S.W.1
9	The Institute of Metals (Birmingham Section). "X-Rays and Crystal Structure." H. B. Keene. 7 p.m.	Chamber of Commerce, New Street.
9	The Institute of Metals (Scottish Section). Professor F. C. Thompson. 7.30 p.m.	38, Elmbank Crescent, Glasgow.

Some Views on Chemical Affinity.—II.

By J. R. Partington, M.B.E., D.Sc.

In his previous article, Professor Partington discussed the relation between thermodynamics and the problem of affinity. He now deals with affinity and atomic structure, and shows how even the heat of reaction may be calculated on the assumption that the forces of affinity are electrical, and that atoms are structures of charged particles.

THE usual explanation of affinity is that it is due to *attractions* exerted between the atoms. This idea arose during the seventeenth century. Boyle, in the *Sceptical Chymist* (1661), says: "there are clusters wherein the Particles stick not so close together, but that they may meet with corpuscles of another Denomination, which are dispos'd to be more closely United with some of them, than they were among themselves." John Mayow, in 1674, gave a very complete account of "elective affinity" based on this theory, but curiously enough, in the section devoted to it he never refers to "corpuscles," whilst in the rest of his book he constantly speaks of them. Mayow explained the liberation of ammonia from a salt by potash, for instance, by the superior attraction of the latter for the acid, which then "lets go" the ammonia, previously "kept down" by the attraction of the acid. Newton, in the *Opticks* (Question 31, in Book 3), gives an account very similar to Mayow's, without mentioning the latter by name.* The rest of his account seems to be borrowed from Stahl's *Fundamenta Chymiae* (1723), in which there is an account of the precipitation of metals by one another from solutions of their salts (p. 26). In this the alchemical *symbols* receive Latin case-endings: ♂ *o=ferro*! Newton, however, put forward one very original and penetrating suggestion: "and perhaps electrical Attractions may reach to such small distances, even without being excited by Friction."

The only serious rival of the attraction theory in Newton's time was Lemery's hypothesis (1675) of spikes on the particles of "sharp acids," which insinuated themselves into the "pores" of metals. Perhaps Newton had this theory in mind when he said: "some have invented hooked atoms, which is begging the question." We may also notice Boerhaave's view. This "great authority" in chemistry of the early eighteenth century had an ingenious theory, which is ably summarised by Dumas: "Il compare cette union à un mariage. Dans l'action de l'esprit de nitre sur le fer, il voit des noces qui se célèbrent, et il faut convenir qu'il y a quelque vérité dans cette comparison poétique."†

The second half of the eighteenth century was dominated by "Universal Attraction," just as that of the nineteenth was by Evolution, and as we are to-day by Relativity. Affinity was then merely a "modified" gravitational attraction. It is true that Geoffroy, in a memoir presented to the French Academy in 1718, refused to mention attraction, but that august body would not sanction the word, probably from jealousy of Newton. In later years the great French naturalist Buffon was able to bring in a "modified" gravitational attraction between the particles. This "modification" of a clean-cut physical conception into a blurred image is quite common in chemistry. In late years it has usually taken the form of "movements of the electrons" to explain many things.

When we come to the end of the eighteenth and the beginning of the nineteenth century, it is interesting to see what views Lavoisier and Dalton had on affinity. The former, in a strange way, refuses to discuss it. "Mr. Morveau is at present engaged in publishing the article *Affinity* in the Encyclopædia, and I had more reasons than one to decline entering upon a work in which he is engaged" (*Elements*, Eng. tr., 1799, p. xxi.). Dalton (who adopted from Newton the idea of *repulsive* forces between particles of gases), has nothing to say about attractive forces, except possibly in one sentence, in which he seems to identify them with gravitation. In the famous section on "Chemical Synthesis," in which the atomic theory is introduced, he is silent on the subject of chemical affinity. The reserve shown by Lavoisier and Dalton is very striking.

"Universal Attraction"

Bergman, who in 1775 extended Geoffroy's Affinity Tables, assumed tentatively that affinity between substances is a fixed quantity. He also considered it to be a form of "universal attraction" (*i.e.*, gravitation). Berthollet also (*Recherches sur les lois de l'affinite*, Paris, An ix., 1801; and *Essai de Statique Chimique*, Paris, An xi., 1803) based his theories on the same idea of gravitational attraction, to which the laws of mechanics may be applied. It is an error to suppose that his ideas on affinity differed from Bergman's; he differed from the latter only in his views on the *effects* of the action of affinity, and on the influence of concentration on these. When Guldberg and Waage (1867) turned Berthollet's somewhat vague ideas into a practically useful theory by "clouding it in a maze of symbols," as some people would say, *i.e.*, when they gave us the Law of Mass Action, they still said nothing about the real cause of affinity. Professor Alexander Smith was in error when he said that the modern way of saying "action of mass" is "action of concentration," as is readily seen by reading Guldberg and Waage's paper. Concentration is only *one* of the things which influences chemical action; the affinity still lurks in the "affinity constants." Van't Hoff replaced the term "affinity constant" by "velocity constant," but he merely avoided the question by so doing.

It would take too long to describe the electrochemical theories of Davy and Berzelius. It is perhaps necessary to state that the common impression that Berzelius's theory was "disproved" by Dumas' work on substitution, and disappeared from chemistry, is wholly incorrect. Dumas and his followers brought forward *one* piece of evidence, since with the simplicity and regularity of Organic Chemistry (then hardly realised) a fact of substitution of hydrogen attached to carbon by a halogen is not fundamentally altered, whatever compound—methyl, ethyl, propyl, etc., or halogen—is used. Multiplying experiments of this kind, which seems to have been accepted as "accumulation of evidence," was of no real significance, and the kind of phenomena contemplated by Berzelius were vastly more general than those comprehended by the chemistry of carbon. Although the latter has swelled to great dimensions, it is but a small part of the chemistry of the elements. Renewed interest in general chemistry led Abegg and Bodländer to a partial resurrection of the theory of Berzelius; it is not surprising to anyone who is acquainted with the theory to find Stark* very recently giving a long account of it, and wondering why chemists had forgotten it! The valency theories of organic chemistry have proved incompetent to explain phenomena in other fields of the science.

Positive and Negative Valency

Abegg and Bodländer distinguished between the *positive* and *negative valencies* of an atom. Negative valencies are exhibited by an electro negative element in the Berzelian sense, such as oxygen or chlorine, when united with an electro-positive element, such as hydrogen or potassium, which possesses positive valencies capable of saturation by negative valencies. An element may exhibit either positive or negative valencies, according to the electrochemical character of the element in combination with it, but the sum is always equal to eight. Thus, Cl in HCl has a negative valency of 1; in $HClO_4$ (in combination with strongly electronegative oxygen) it has

* Newton's chemical activities do not appear to have been examined. The writer possesses several chemical books which formerly belonged to Newton. They are alchemical in character, including the works of Van Helmont, Lully, and Maier. He has also seen copies of the works of Geber, and of the "Turba Philosophorum" (an obscure alchemical treatise showing distinct early Alexandrian influences) with copious notes in Newton's hand. Had Newton's alchemical studies anything to do with his position as Master of the Mint? We are told that he constructed telescope mirrors of an alloy of copper and arsenic, the preparation of which is described by the Alexandrian alchemists of about the fourth century.

† The amusing account contained in the original Latin text (*Elementa Chemiae*, Leyden, 1732, Vol. i., p. 678) is much bowdlerised in Shaw's English translation.

* *Die Elektrizität im Chemischen Atom*, Leipzig, 1915. Dedicated to the memory of Berzelius.

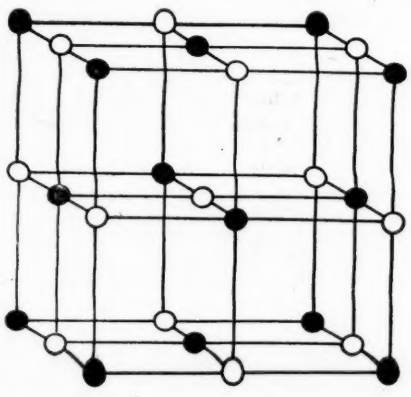
a positive valency of 7. Sulphur in H_2S has a negative valency of 2; in SO_3 and SF_6 it has a positive valency of 6. Carbon has no pronounced electrochemical character, and its positive and negative valencies are both 4, hence it is a very simple case.

These results are clearly explained by the view of the structure of the atom due to Rutherford, and developed by Moseley, Kossel, G. N. Lewis and Langmuir. Atoms contain positive nuclei surrounded by zones of negative electrons, the number of which is equal to the net positive charge on the nucleus. The number of outer electrons is equal to the number of the series which the element occupies in the periodic system. Chlorine has 7 outer electrons. It can take up one more (negative valency), to form an outer layer of 8 (negative valency), or lose 7 to form an octet with another atom or atoms (positive valency). The inert gases have no tendency to combination, and always have completed outer zones or octet of 8 electrons (except helium), with no outer valency electrons.

In the combination of sodium metal with chlorine gas, the loosely held outer valency electron of the sodium atom is dragged from it, and makes up an octet of electrons around the chlorine atom, adding itself to the 7 valency electrons of that atom. The sodium atom by losing an electron becomes a sodium ion, Na^+, and the chlorine atom by gaining an electron becomes a chlorine ion, Cl^-. Both ions are surrounded by octets. The ions attract each other in virtue of their opposite charges and form a molecule of NaCl. No additional valency forces are required. This type of combination is characteristic of what are called *heteropolar compounds*, *i.e.*, ionised structures. In the case of *homopolar compounds*, such as O_2 or CO, instead of electrons being transferred from one atom to the other, the atoms hold electrons in common, or *share electrons*, as explained in Dr. Miall's excellent articles in former numbers of THE CHEMICAL AGE. In order not to complicate the present discussion, it will be confined to heteropolar compounds, or salts.

Physical Properties and Structure

Born and Landé, in 1918, made a considerable advance in calculating a large number of the physical properties of salts from this view of their structure. It has been possible to show, for instance, that the charges on the ions composing salt crystals are those predicted by the theory. This may be proved by measurements of the reflexion of infra-red radiations, and by X-ray reflexions. In the first method, if it is assumed that the charged ions are actually present in the crystal, they should be capable of oscillating when exposed to alternating electric fields, such as those supposed to exist in light or radiant heat. For a certain frequency of oscillation in the radiation striking the crystal, we should expect to obtain resonance and strong reflexion. This is the case, and in this way the frequency of oscillation of the ions in the crystals may be found. Again, an orderly collection of positive and negative ions such as is supposed to constitute a salt crystal will tend to contract, owing to the attraction between the positive and negative charges. The repulsions between like



charges are much smaller, on account of the greater separation of like as compared with unlike ions. This is easily seen from the figure, in which black and white circles may represent Na^+ and Cl^- ions, respectively, arranged in a crystal of rock salt according to researches on X-ray spectra. If, therefore, the ions are separated to infinite distances, a certain amount of work will have to be expended in breaking up the crystal: this work is given by $13{\cdot}94e^2/d$, where e is the charge on the electron and d the distance between two *similar* ions in the crystal lattice.

In order that the ions in the crystal shall remain separated, there must be some repulsive force also between them. Born and Landé find from the experiments of Richards and Jones on the compressibility of crystals that this repulsive force is given by b/d^9, where b is a constant. Assuming the value 9 for the power of d, it is, therefore, possible to calculate the elastic properties of materials from the electrical forces between the ions. There is a connexion between this and the theory of atomic structure put forward by Sir J. J. Thomson. He thinks the negative electrons are attracted by the positive nucleus beyond a certain distance from it, but repelled by it within this distance. The electrons will, therefore, arrange themselves in positions of equilibrium around the positive nucleus. The stable figure for 8 electrons is not a cube, as Lewis supposes, but a "twisted cube." The repulsive force is of the form b/d^8, when d is the distance between the electron and the nucleus.

Heat of Formation

The *heat of formation* of molecules of the type AB from the atoms A and B is not, as was shown in the first article, a correct measure of the affinity. It is shown by Nernst's theorem, however, that the value of the heat of formation at the absolute zero (it varies with temperature) is equal to the free energy change—*i.e.*, to the affinity, also at the zero of absolute temperature. In many cases, as was also mentioned, the heat of formation is an *approximate* measure of the affinity. The heat of formation may then be put equal to the work which must be spent in tearing apart the molecule into its constituent atoms (or ions) and separating these to an infinite distance. This work is calculable, however, as soon as we know the distances apart of the atoms in the molecule, or the ions in the salt crystals, and the forces acting between them. The interatomic distances are known as the result of the work of the Braggs on X-ray reflexion by crystals, and the interatomic (or inter*ionic*) forces can be approximated to, as has just been shown. Calculations of this kind, it will be observed, are at present confined to salts—*i.e.*, ionised structures, or *heteropolar compounds*. But there is little doubt that in a short time other cases also will prove amenable to slightly modified calculations. The calculations have been made for heteropolar compounds by Fajans, Born and Landé, and Haber. In this way the heats of formation (at the absolute zero) of various haloid salt molecules of the type MX from the *ions* have been calculated. They are not comparable with any directly observed magnitudes, but they can be applied to calculate heats of reaction which can be compared directly with the experimental values. Reactions of the type NaCl+KI=NaI+KCl may be dealt with as follows:—(1) The NaCl and KI are supposed first dissolved in a large quantity of water, so that they are completely ionised into Na^+, K^+, Cl^-, I^-. The heat evolved will be the sum of the heats of solution of the two salts: $Q_1=Q_{NaCl}+Q_{KI}$, which are measurable. The same solution is obtained by starting with the salts KCl and NaI, when the heat evolved is $Q_2=Q_{KCl}+Q_{NaI}$. Hence (2) If the ions are supposed removed from the solution and combined to form the solid salts KCl and NaI, the heat evolved would be $-(Q_{KCl}+Q_{NaI})$. We have now arrived from solid NaCl+KI at solid NaI+KCl, the heat evolved being $Q=(Q_{NaCl}+Q_{KI})-(Q_{KCl}+Q_{NaI})$. This, however, is also calculable from the heat of formation of solid crystals, as has been shown. The two sets of values are in very fair agreement:

Reaction.	Q from theory.	Q from heat of solution
KCl+NaI=KI+NaCl ..	5	3·4
KCl+NaBr=KBr+NaCl ..	3	2
KCl+LiBr=KBr+LiCl ..	4	3·6
KCl+LiI=KI+LiCl ..	7	7·2

Further progress can still be made. When one or more electrons are torn away from the atom of a metal we are left with the positive ion of the metal: K−electron=K^+. Now the work of tearing away the electron can be calculated from the quantum theory by making use of Bohr's theory of spectra.

According to this, the electrons revolve around the positive nucleus in rings, and each ring is defined by a definite amount of energy associated with the electron. When an electron "falls" from one ring to a smaller ring it evolves the difference between its energy in the first and in the second rings as quanta of radiation of definite frequency. The energy quantum lost is equal to this frequency multiplied by a universal constant h: $\varepsilon = h\nu$ (when ν = frequency). This corresponds with a line in the spectrum. The larger the diameter of the ring in which the electron revolves, the higher will be the frequency of the radiation emitted when it falls into a ring near the nucleus of the atom—*i.e.*, into its "natural state." When it falls from an *infinite* distance, we have the formation of the neutral atom from the electron and the ion, and the energy change in this process is, therefore, given by $\varepsilon = h\nu_\infty$, when ν_∞ is the frequency of the line of *shortest wave-length* (highest frequency) ever observed in the spectrum. In this way, by spectrum measurements, the *heats of ionisation* of several metals have been determined:

Metal	Li	Na	K	Rb	Cs
Heat of Ionisation: M − electron = M^+, I Kg. cal. per gram atom	123	117	99	95·1	88·6

We note in passing that the work required to drag out an electron diminishes as the atomic weight, and the atomic volume, increase. We should expect this, as in bulky atoms the attraction between this outer electron and the nucleus will be smaller. These values can now be used in calculating the heat evolved in reaction such as: $NaCl + K = KCl + Na$, when the metals are in the vapour state. Then $Q = Q_{KCl} - Q_{NaCl} + I_{Na} - I_K$. This can be compared with the experimental values, and the agreement is satisfactory.

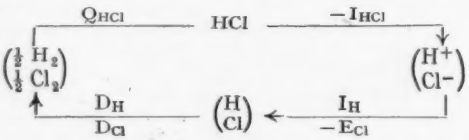
Ionisation Energy

The ionisation energies of *negative* elements, such as halogens, are also calculable. The union of an electron with a neutral atom, to complete the octet, is always accompanied by an evolution of energy: the negative ion is more stable than the neutral atom. This energy change cannot be determined directly, as in the case of positive ions, but can be calculated by difference from the energies of the salts, and the ionisation energies of the metals, obtained as described above. By performing the calculations with various salts of the same halogen, we find the same value for the energy of ionisation of the latter, as we should do. This value, which is a measure of the affinity between an electron and the neutral halogen atom, is called the *electro affinity*. The following are the values in kg. cal. per gram atom:

$E_{Cl} = 119$ $E_{Br} = 84$ $E_I = 77$.

The affinity diminishes with increasing atomic weight, as would be expected, since the tendency to form ions decreases in the same direction.

Lastly, consider the energy of formation of gaseous hydrogen chloride from its ions. This can be derived from the following cycle:



One molecule of HCl is converted into the ions H^+ and Cl^-, the energy evolved being $-I_{HCl}$, *i.e.*, *minus* the energy of formation required. An electron is then taken from the Cl^- ion, absorbing energy E_{Cl} (the electro affinity), and given to the H^+ ion, neutralising it, and evolving energy I_H, where I_H is the energy of ionisation of hydrogen. The neutral atoms are then combined into molecules, evolving the heats of dissociation, D_H and D_{Cl} (which are calculable from measurements by Langmuir and by Victor Meyer on the extent of dissociate of H_2 and Cl_2 by heat). The molecules are then combined to form the HCl molecule, evolving the ordinary heat of combination Q_{HCl}. The only unknown, besides I_{HCl} (which is to be calculated) is I_H, the energy required to drag an electron from a hydrogen atom. Since the hydrogen atom is a very simple structure, consisting of a single electron revolving around a unit positive nucleus, this energy is easily calculated from the hydrogen spectrum by Bohr's theory. It is $I_H = 310$ kg. cal. per gram atom of hydrogen. Thence we find $I_{HCl} = 320$. Similarly, $I_{HBr} = 311$; $I_{HI} = 303$. A glance at these numbers, and at the value of I_H, shows that the separation of a negative ion such as Cl^-, Br^-, or I^-, from a hydrogen ion, H^+, requires about the same amount of energy as the separation of an electron from the H atom. This is an important result, but it cannot be discussed further here.

Haber, by considering a metal as constituted of positive ions and free electrons, has calculated in a similar way the latent heats of evaporation of metals.

Summary

We may now attempt to summarise the rather superficial discussions in the two articles. In the first article an attempt was made to show that a true measure of chemical affinity is the free energy change in the chemical reaction. Thermodynamics teaches how this can be calculated from the heat of reaction, the specific heats, and the value of the equilibrium constant. But the free energy can be found in other ways, hence from these (*e.g.*, by experiments with cells) the equilibrium constant can be calculated if the heat of reaction and the specific heats are known. Nernst's theorem enables us to find one value of the equilibrium constant from tables of chemical constants. These can be calculated in some cases by the quantum theory from the dimensions and structure of the molecules, from which also, in some cases, the specific heats can be deduced. There remains unknown the heat of reaction—strictly speaking at the absolute zero.

The second article is an attempt to show how even the heat of reaction may be calculated on the assumption that the forces of affinity are electrical, and that atoms are structures of charged particles. This part of the subject is still very incomplete, but progress is rapid, and we may soon hope to answer the question of the chemist: "What will happen when such and such things are brought together under such and such conditions?" by calculations with tables of fundamental constants. When this is the case, chemistry will have become an exact science, and the "sooty empiricks" will be without honour in the land.

Causes of Boiler Corrosion

Variations in Composition of Plates

A MEETING of the Nottingham Section of the Society of Dyers and Colourists, was held on December 14. Mr. Pentecost presided, and Mr. S. R. Trotman, F.I.C., read a paper embodying some work which he had carried out in conjunction with Mr. Pentecost on some cases of boiler corrosion, as well as some several results which he had obtained on the corrosive effects of the usual salts which are present in boiler feed water.

The most important factor appeared to be the variations in the composition of the boiler plates, or even in heat treatment of adjoining parts. Given such inequalities, then the principal causes of corrosions might be divided into (*a*) magnesium chloride; (*b*) sodium sulphate and chloride; (*c*) bicarbonates. The hydrolysis of magnesium chloride proceeded to a considerable, but unknown, extent, at the temperatures which prevailed in boilers. The hydrochloric acid had been known to accumulate up to 1 per cent. The action did not appear to be entirely inhibited even by the existence of a neutral or slightly alkaline reaction. Magnesium chloride might directly remove a protective coating of ferrous hydroxide. Bicarbonates and free carbonic acid might undergo a reversible decomposition with calcium chloride giving free hydrochloric acid.

The corrosion of iron by carbon dioxide required oxygen, which was practically always present in waters, and often more in softened than in unsoftened. Sodium sulphate might set local electric couples. According to the author's experiments, inantoclaves of 2 per cent. solution would attack iron in absence of oxygen, but other investigations held that oxygen was necessary. In order to remove the oxygen, Mr. Trotman suggested that the water might be run over heated iron plates in a partial vacuum, or treated with ferrous sulphate and lime.

"Chemical Age" Letters from America.—VII.

A Day at Wilmington—The Great Du Pont Organisation—Mr. Irenee Du Pont and the Tariff

—Hercules Powder Co.

Wilmington, Delaware.

PALATIAL as most of the American business houses are, the Du Pont Hotel and Headquarters at Wilmington, Delaware, remains in one's recollection as one of the most splendid. Wilmington is a considerable industrial area. It rises near its centre to a sort of mound, on the crown of which stands the great Du Pont building, dominating all the surrounding country. The hotel itself, with its beautiful Tudor entrance hall and its perfectly appointed rooms, is a centre of attraction to travellers, many of whom instead of travelling on to Philadelphia drop off at Wilmington for the mere pleasure of staying there. Inside the building are accommodated the immense headquarters staff of the company, and their only criticism of the scheme is that the accommodation is so complete that they need never go outside the building.

Near by is the Hercules Powder Company's building, another typical American structure closely related to the Du Pont organisation. Under the guidance of Dr. Norman, who had recently returned from Europe, I spent a morning in going through it. Mr. R. H. Dunham, the President, received the party with great cordiality, discussed business prospects in England and America, and seemed very much struck by the similarity in the conditions. One of the most interesting departments was that devoted to publicity. Not only does the firm publish a very attractive house journal, known as *The Mixer*, but its publicity scheme includes a wide range of very well produced pamphlets and books dealing with the part explosives play in all kinds of public and industrial activities. This kind of advertising, almost unknown in England, and known here as institutional advertising, is quite a familiar piece of propaganda in the States. The idea is to impress the public with its indebtedness to some particular industry, and then, having created a favourable atmosphere, to go in and get specific business If the article is powder, the scheme is to tell the public all about the uses of powder; and then follows the application, "If you are a user of powder, ours is the powder for you."

This style of advertising is admirably illustrated by the range of the Hercules Company's publications. They are in the best sense educational, instructing the public in the commercial and industrial uses of explosives, at the same time giving expert advice as to the right explosives to use for different purposes, and supplying to the sportsman and business man just the practical kind of information he would seek in a textbook. My visit happened to be on the date of the monthly luncheon of the Hercules Club. It was attended by a large company of employees in one of the large halls of the Du Pont building. Some eight or ten guests were formally welcomed and short addresses followed. As the only British guest present I had to give some impressions of America, and one of the American guests, just returned from Europe, gave an account of the condition of things there.

In going later through the Du Pont building I had the great advantage of the company of Dr. Stiene, whose knowledge, especially of the dyestuffs industry, is as intensive as it is extensive. The first interview was with Mr. Irenee Du Pont, the president, who, busy as he must be, found time for a courteous welcome and a short chat. When asked how it was that America had suddenly rejected the Dye Embargo, he remarked that if we could only tell them that we should be cleverer than anybody in the States. Various explanations had been offered of the change of policy on the part of the American Senate, but at Washington in all these matters there were so many underground influences that it was almost impossible to discover the real reason. The rejection of the Embargo might, he thought, have a serious effect, but it was too early to say definitely, and he certainly hoped it would not have the effect of destroying the American Dye Industry. Asked for his opinion as to how long a period of protection was needed, he replied: "I should say that a period of about 10 years would be a fair test. There is no doubt America wants a native dyestuffs industry. In that case they should have calculated the cost of establishing it and given the necessary safeguards." "That," he added, "would be the English way of doing it, and you have obviously handled the matter rather better than we have." Speaking generally of the chemical industry, he said that it had passed through a serious crisis, but was now improving. The company had received very strong assurances of support from numbers of people who felt the importance of the American dyestuffs industry, and they were hoping that these people would stand by them. "In any case," he concluded, "we intend to go forward and do our best, and shall certainly hope and work for ultimate success."

Col. W. C. Spraunce supplemented the president's statement by some interesting views upon the effects of the exchange, and afterwards I had an opportunity of going over the points quietly with Dr. Stiene in his own department. I should like to have been able to give in detail Dr. Stiene's rapid analytical review of a situation which he understands from the inside as few men can claim to do, and in which he is very keenly interested, but the most that is possible is a general outline of the case. Dr. Stiene explained that before the war they touched the dyestuffs industry at a few points, and could have developed these with little trouble; but, he added, "you cannot establish a dyestuffs industry in that way. If you are going to establish a complete dyestuffs industry you cannot do it by producing a few things here and there; you must think of the industry as a whole, and make your plans accordingly. We started, therefore, from the very groundwork and have been working on a comprehensive basis. We may be asked—Why not just take up sulphur black, basic colours, and such like? My answer is that you cannot develop the dyestuff business in that way or sell all your products. You must take up the industry as a whole, and that is what we have been doing with success."

DU PONT HOTEL AND OFFICE BUILDING

It recalled an interview with Mr. C. A. Hill, the chairman of British Drug Houses, Ltd., in which he had taken up exactly the same point in relation to the British fine chemical industry. I gathered that here, as in England, the policy was towards restricting variety and improving quality. When I had gone through the technical sales service branch, the patent reference library, and other departments, one realised how truly Dr. Stiene had described the thoroughness of the Du Pont organisation—scientific, technical and commercial—and the immense importance to America of having such an organisation not only for the supply of immediate dyestuff needs but as a research centre and as a provision against a similar emergency to that which arose during the war. Dr. Stiene emphasised, as every dyestuff chemist invariably does, the vital importance of working experience and continuous research. Success does not lie in the knowledge of formulæ and such like book knowledge; it depends more often on some trick in operation which is only discovered by experience, and for this reason it is essential that a complete industry should be maintained and

improved and strengthened year by year with working experience and with fresh research.

Dr. Stiene was, of course, disappointed with the attitude of Congress in rejecting the embargo after the liberal assurances of support given in the early days of the company's dyestuff enterprise, but instead of a disposition to surrender what had been gained, I found a determined resolution to press on with the work. There was one significant remark with which the conversation closed. "If," said Dr. Stiene, "the word 'dye' had the same covering power as the word 'vote' in American politics, the action of the Government to-day would be very different from what it is." I left impressed with the scale of the Du Pont organisation, and with its value to the nation.

Before leaving this subject, one may record one really courageous thing that I heard Dr. Reid, Johns Hopkins professor, say in an address on the evening of my visit to the members of the Delaware Section of the American Chemical Society, to which I was invited. Dismissing the thought of failure as impossible, he predicted that American chemists would never consent to be beaten by German rivals. "We can make numbers of other things," he said, "better than Germany, and sell them to Germans. Why should not we send representatives to Berlin to sell American dyes in Unter den Linden, and make the Germans pay the tariff? It will not be so many years before we shall be selling American dyes as well as American machinery to German buyers." It was a really refreshing note of optimism.

F. E. HAMER.

Society of Glass Technology

Use of the Autoclave in Glass Testing

A MEETING of the Society of Glass Technology was held at University College, London, on Wednesday, December 13.

Professor W. E. S. Turner, who presided, referring to the death of Mr. Harry Powell, said that he had had among his hopes the preparation of various papers and books dealing with historical aspects of the glass industry. A letter had been sent by the Council conveying the Society's condolence with the family and the firm, and he asked the members to signify their approval by standing. The Directory which the Society was preparing, and would be available for issue at the beginning of January, would be issued to members at 6s., and to non-members at 7s. 6d. As to the visit to Paris, which was on the programme for March, it had been suggested that a better time for the visit would be about the end of May or the beginning of June, and it was proposed to accept that date instead of March.

A paper on "Improvements in the Design of Recuperative Glass for Furnaces" was read by Mr. T. Teisen, who described the Hermansen type recuperative pot furnace, which had been installed, among other places, in the Lemington Glass Works, and said that his own experience had been that although there might be cases where other types such as the regenerative were preferable, for most purposes a well-designed recuperative furnace would not only meet the case, but be superior both in fuel, repairs, and general running cost as well as initial outlay.

A general discussion followed on "The use of the Autoclave in testing glass." Mr. W. L. Baillee, in a paper on "Some Aspects of the Autoclave Test," claimed that when the necessary precautions were taken the autoclave test was reliable and expeditious, and its consideratoon as a standard test was strongly urged.

In "Some Criticisms on the Use of the Autoclave as a Method of Testing Glassware," Mr. W. H. Withey, of the National Physical Laboratory, concluded that to make the autoclave test really reliable, it was imperative to determine the effects of the attack at different pressures and at comparatively short intervals of time, as by such means only was it possible to trace the progress of disintegration.

In a paper on "Some Difficulties in the Interpretation of Autoclave Results," by Professor W. E. S. Turner and Mr. F. W. Hodkin, it was urged that if a single test was devised, the boiling water test on crushed or powdered glass sieved to a certain size was as simple as any and generally as trustworthy. Professor Turner said that there was not a great deal between himself and the other two authors and the general body of glass workers, but he did not think they could place reliance upon the autoclave test as a single test.

Bureaucracy in Industry

A Critical Address by Professor Armstrong

IN an address on "Legislative and Departmental interference with industry and the commonweal," before the Nottingham Section of the Society of Chemical Industry, Professor H. E. Armstrong dealt with the subjects of milk, lead paint, smoke abatement, smokeless fuel, dyestuffs, and research.

The abuse of the Food Acts, he said, by blending milk to obtain a low quality, had been going on for fifty years. It was known to the Government Departments concerned, who, however, did nothing to protect the public. Now the Ministry of Health had sanctioned a measure which provided that dirty milk might be rendered harmless by heating. The subject was insufficiently investigated, but probably this process destroyed some vital constituent in a food produced by the living for the living. Why should we denaturalise milk as we did methylated spirit? The souring of milk was a natural change which was even beneficial according to the views of Metchnikoff. The bacteria took advantage of our stupidity since nothing encouraged tuberculosis so much as a defective diet. The valuation of proteid foods by their percentages of nitrogen was already proved an error by the work of Fischer. The essential advitants in foods were especially liable to be destroyed by the long stewing which the food underwent in restaurants, to the detriment of the city worker, who perhaps was only saved by the fresh products of the street hawker.

The Unscientific Bureaucrat

The use of the most effective paint was being cut off by the bureaucrat and the sentimentalist without proper scientific inquiry. The decision at a recent conference that the use of lead paint for internal painting should be prohibited was carried without consultation with the delegates from U.S.A. and against the opinions of Australian and Canadian delegates.

The Commission on Smoke Abatement was mainly concerned with quite unnecessary proofs that such a nuisance existed. A great opportunity of exhibiting to the public the advantages of smokeless fuel had been lost. Experiments on this subject had been carried out, not by the large coal owning and using interests, but by a few private individuals equipped with energy and imagination. The work of H.M. Fuel Research Board in this direction was not likely to achieve the desired result. The nation was really fed upon coal; by its misuse we had called into existence too large an industrial population, and in order to maintain this population we could not be too careful to use the coal well.

With regard to the Safeguarding of Industries Act, he thought that the chief if not the only gainers were the legal fraternity. The lists of scheduled articles were the product of the Board of Trade's uninstructed imagination and required complete revision by competent chemists. The decision that calcium carbide was not a synthetic organic chemical was against every canon of chemical belief and the inclusion of sodium hyposulphite as an analytical reagent was a most disingenuous decision.

Freedom for Research

The first condition of success in the dyestuffs industry was direction by really competent persons. There were here conflicting interests, but some sacrifice must be made if we were to recover the position lost by thirty years of neglect. In regard to the fine chemical industry, he was actuated mainly by pride of race—he claimed to be as good a player at the art of chemistry as the Germans, and the right to compete on fair terms on the links of which we were old members, but from which they were trying to exclude us.

In research, the freedom of action, as necessary to the chemical investigator as to the poet and painter, was being threatened by a bureaucratic body largely controlled by literary men. This body has displaced the Royal Society, which had sunk into exceeding dulness and no longer counted with the public. Mr. Saintsbury had shown how an abuse of the blessed word research had led to the most unblessed results. Students were encouraged to dignify by the name of research a few repetition exercises. But most were not and never would be researchers. He urged young chemists unable to obtain chemical appointments to go into anything for a few years in order to gain the knowledge of life which they lacked at present.

Society of Dyers and Colourists

Papers Read at Manchester Meeting

A MEETING of the Manchester Section of the Society of Dyers and Colourists was held on December 15, Mr. J. Campbell Gray presiding. A paper on " A New Class of Acid Dyestuffs " by Professor A. G. Green and Mr. K. H. Saunders, B.Sc., was read by Mr. Saunders.

" Sulphato " Dyestuffs

The paper gave an account of a series of investigations, which had been carried out in the research laboratories of the British Dyestuffs Corporation, upon a new principle of dyestuff synthesis, discovered by the authors. The principle, which was applicable to almost all groups of dyestuffs, but more especially to the triphenylmethane and oxazine series, allowed of the production of " acid " dyestuffs without the introduction of sulphonic groups, the requisite solubility in water and " acid dyeing " properties being obtained by the presence of sulphuric ester groups attached to nitrogen. These solubilising groups were termed " sulphato " groups, and the new class of acid dyestuffs to which they gave rise were termed " sulphato " dyestuffs. The lecturer described the chemical methods which had been employed in building up these new colouring matters, and exhibited dyed patterns of a number of them. These ranged from red through violet to blue and green, all of great purity and brilliance.

In general terms the method of preparation might be said to consist in synthesising intermediates containing the atomic grouping, $N.C_2H_4.SO_4H$, which intermediates were prepared by the action of sulphuric acid upon oxyethyl amines of the benzene and naphthalene series, these latter, in turn, being obtained from amido compounds and ethylene chlorhydrin. Starting from these " sulphato " intermediates, the dyestuffs were built up by the application of known synthetic methods. Though it was too early to speak at present of the commercial value of the discovery, it afforded further evidence of the intense research activity at present prevalent in the British dyestuff industry.

Hypochlorous Acid Solutions

A paper " On the Effect of Hypochlorous Acid Solutions and Bleaching Liquors on Cellulose," by Professor E. Knecht, F.I.C., and Mr. J. P. Egan, M.Sc., was read by Professor Knecht, and described the results of experiments which went to show the extent of the attack of bleached cotton yarn by known quantities of different bleaching agents. With bleaching powder a tendering of 20 per cent. was brought about by the equivalent of as little as 0·16 per cent. of oxygen, whereas in the permanganate bleach tendering was not nearly so marked when this amount of oxygen had been used up. Professor Knecht said that solutions of hypochlorous acid and of bleaching powder were very stable when kept in completely filled, closely stoppered bottles, for one week in the dark, but when cellulose was added the loss of available oxygen could be readily estimated. Blank experiments, in which no cotton was added to the liquors, were carried out, using the same standard solutions in order to permit of a correction being made to allow for any slight instability of the liquor. From the results so obtained, the amount of available oxygen which was used up by the yarn during the experiment was calculated. The original estimation was with respect to available chlorine, but the results had been expressed in the form of oxygen.

Oxidation of Dyed Cotton Yarn

Professor Knecht also read the above-titled note, in which he said that experiments were carried out to compare the effect of varying quantities of oxidising agents on bleached cotton yarn which had been dyed with cutch, and on cotton yarn which had not been treated after bleaching. The yarn was boiled in the ordinary way with 30 per cent. cutch, in the presence of copper sulphate, and afterwards chromed. The oxidation was carried out by means of potassium permanganate in the presence of sulphuric acid.

Yarn dyed with cutch and oxidised with one-sixth of an atom of oxygen required only 18 oz. to break it when tested in the single-thread testing machine, whereas a similar yarn unoxidised required 20 oz. Ordinary bleached yarn gave an extremely tender product. The ordinary yarn, after oxidation, with one-sixth of an atom of oxygen had a copper value of 7·7. The yarn dyed with cutch and oxidised had a copper value of only 4·05. This latter value was probably high owing to the presence on the oxidation fibres of the cutch itself. The copper values of the yarns oxidised with $\frac{3}{4}$ of an atom of oxygen proved to be ordinary bleached yarn 14·9 and yarn dyed with cutch 14. This indicated that selective action took place. The result of the oxidation was to remove the cutch and the cellulose was then attacked. This was confirmed by the fact that when an attempt was made to oxidise the yarn dyed with cutch with 1-12 of an atom of oxygen the permanganate was very rapidly discolourised, but the yarn remained quite brown in parts owing to the incomplete removal of the cutch.

Referee's Oxalic Acid Decision

Improper Inclusion Claim Fails

THE Referee has given his decision in regard to the complaint that oxalic acid has been improperly included in the list of dutiable articles issued by the Board of Trade under the Safeguarding of Industries Act.

The question in this case, said the Referee, was whether oxalic acid was properly included in the list of dutiable articles. The inclusion in the list was justified on three grounds: (1) that oxalic acid is a synthetic organic chemical; (2) that oxalic acid is a fine chemical; (3) that oxalic acid is an analytical reagent. He was not satisfied that oxalic acid was a fine chemical. Indeed, he thought it was not. He was quite satisfied that its inclusion could not be justified on the ground that it was an analytical reagent, but he had concluded that it was a synthetic organic chemical, and as such, rightly included in the Schedule. The question whether oxalic acid was a synthetic organic chemical was entirely a matter of opinion, depending upon the view held as to the precise limitations of the meaning of the word synthetic. There was no doubt that oxalic acid was an organic body which could be built up from its elements. The process began with the use of carbon, the number of carbon atoms in the molecule was increased and the molecule became heavier. The molecular construction contained two atoms of carbon linked together. Although in practice the first step in building up was the combining of carbon monoxide and caustic soda, both those substances could be obtained from their elements.

A Synthetic Process

The decision as to whether the steps were orderly seemed to turn upon the view taken of the heating of the sodium formate causing the hydrogen to be liberated and the two unsaturated links to combine, forming sodium oxalate. A temperature of 440°, or thereabouts, was necessary to produce this reaction, except in the presence of sodium carbonate or certain other substances when a lower temperature would suffice—viz., 300° to 350°. In this sense it was a controlled temperature. It seemed quite impossible to rule out a reaction depending upon a controlled degree of heat from those steps regarded as synthetic. But it was said that it was impossible to draw any inference as to the structure of sodium oxalate from the reaction in question. If the molecular structure of a substance was known before it was synthesised, and that knowledge was capable of suggesting and did suggest steps which might possibly bring about that result, and then by experiment it was found that those steps did in fact produce that result, it seemed to him that such steps were entitled to be considered as synthetic. The view he took, after a very careful review of the evidence, both in this and the camphor case was that oxalic acid obtained by the formate process was synthetic.

Dealing with Mr. Swan's argument that the expression " synthetic organic chemicals " was limited to fine chemicals, the Referee said he adhered to the view he had expressed in the sodium phosphate case that the particular description " all synthetic organic chemicals " could not be cut down or defined by the more general words " all other fine chemicals." He therefore decided that oxalic acid manufactured by the formate process was properly within the Schedule, and the complaint accordingly failed.

November Trade Returns

Chemical Exports Increased by £285,700

ACCORDING to the Board of Trade Returns for November, our exports of chemicals, drugs, dyes and colours, valued at £1,876,069, were £285,782 greater than in the preceding month, but it must be remembered that the October figure was £143,596 below that for September. In effect, therefore, the month under review shows a genuine improvement of no less than £142,186 on September. Imports, at £1,068,086, were also higher by £101,874. As compared with November of last year the month's export and import totals are £478,064 and £209,011 greater respectively.

Bigger Sodium Nitrate Imports

A comparison between quantities imported in November and October of this year respectively, shows that increasing quantities of sodium compounds, calcium carbide, bleaching materials, distilled glycerin, potassium nitrate, and zinc oxide have come into the country; a considerable decrease in the importation of crude glycerin and potassium compounds other than nitrate is also indicated.

The detailed import figures, in cwts., unless otherwise stated, are given below with the October figures in parenthesis:—Increases: Bleaching materials, 3,099 (2,775); calcium carbide, 82,301 (77,769); distilled glycerin, 245 (236); red lead and orange lead, 3,822 (3,707); potassium nitrate, 8,401 (3,640); sodium nitrate, 179,084 (63,570); sodium compounds, other than nitrate, 23,487 (18,939); and zinc oxide, 588 tons (557). Decreases: Acetic acid, including acetic anhydride, 582 tons (695); tartaric acid, including tartrates not elsewhere specified, 1,049 (1,335); borax, 4,040 (5,621); crude glycerin, 868 (5,225); potassium compounds other than nitrate, 458,933 (608,513); and cream of tartar, 2,227 (2,454).

Recovery in Sodium Compounds

One of the features of the export side is a general improvement in sodium compounds, except sulphate; big rises in tar oil and creosote, naphtha, and naphthalene are also noticeable. In addition to a large drop in sodium sulphate there are remarkably few large decreases, the chief being potassium nitrate, carbolic acid, and benzol and toluol. Shipments of sulphate of ammonia were 4,399 tons above the October figure. Of the November total of 14,058 tons of the declared value of £241,874, Spain and the Canaries, with 5,662 took the largest proportion. The Dutch East Indies came next with 3,350 tons, and was followed by the British West Indies with 1,160 tons; Italy with 300 tons; and France with 202 tons. Other countries which are not enumerated took 3,384 tons.

The following figures show in detail the products the November exports of which were larger (as to quantity) than in the preceding month; the October totals are given in parentheses and the figures represent cwts. unless otherwise stated:—Sulphuric acid, 1,076 (898); ammonia chloride (muriate), 456 tons (450); sulphate of ammonia, 14,058 tons (9,659); bleaching powder, 25,484 (22,325); naphtha, 5,949 galls. (2,486); naphthalene, 9,927 (4,908); tar oil, creosote, etc., 2,938,137 galls. (500,655); coal tar products not elsewhere specified, 27,235 (18,561); copper sulphate, 2,282 tons (842); crude glycerin, 2,991 (120); distilled glycerin, 14,021 (8,216); potassium chromate and bichromate, 2,191 (1,801); sodium carbonate, including soda crystals, soda ash and bicarbonate, 437,478 (381,299); caustic soda, 121,728 (113,608); sodium chromate and bichromate, 4,692 (1,785); sodium compounds other than those mentioned above and sulphate, 49,425 (44,746); and zinc oxide, 222 tons (172).

The decreases, similarly compared, are:—Tartaric acid, including tartrates not elsewhere specified, 1,098 (1,277); benzol and toluol, 5,427 galls. (5,906); carbolic acid, 10,000 (13,454); potassium nitrate, British prepared, 910 (1,373); potassium compounds other than chromate bichromate and nitrate, 1,925 (2,911); and sodium sulphate, including saltcake, 174,726 (264,772).

Dyes and Dyestuffs

With the exception of unenumerated dyes and coal tar intermediates, the dye imports for the month are smaller. November is the tenth month of the year in which no synthetic indigo has been received, the only imports being 7 cwts. in October. The total for the eleven months to November 30, 1921, was 7,081 cwts. of the declared value of £104,336.

The comparative figures for November and October of this year are, respectively:—Coal tar intermediates, 24 (7); alizarine, 384 (560); synthetic indigo, nil (7); dyestuffs, other sorts, 6,581 (3,249); cutch, 2,205 (5,690); extracts for dyeing, all other sorts, 14,038 (10,115); natural indigo, 49 (78); and tanning extracts, 80,367 (59,833).

Lower Prices of Dyes

Exports of dyes and dyestuffs show a considerable increase over October figures, the total being 3,449 cwts. greater. The bulk total of 12,485 cwts., made up of 4,561 cwts. of coal tar products (as against 4,237) and 7,924 cwts. of other sorts (as against 4,799), was valued at £59,863, whereas the previous month's values total was £64,890. Although the quantity exported was 3,449 cwts. larger the value was £5,027 smaller.

Painters' Colours and Materials

Imports of painters' colours and materials were all larger, the chief increase being noted against barytes. On the export side, barytes and white lead were lower, the other items all showing moderate improvement. The comparative figures are:—Imports: Barytes, ground, including blanc fixe, 48,437 (25,109); white lead (basic carbonate), 11,188 (10,044); and painters' colours and materials, other sorts, 42,685 (42,073). Exports:—Barytes, ground, including blanc fixe 5,076 (5,322); white lead, 14,897 (15,019); paints and colours ground in oil or water, 29,823 (20,272); paints and enamels prepared, including ready mixed, 20,566 (19,544); and painters' colours and materials, other sorts, 47,763 (41,523).

Physical Chemistry in Metallurgy

Co-operation between Chemists and Metallurgists

IN a lecture before the Chemical Society on December 14, Dr. C. H. Desch indicated some directions in which the close co-operation of the chemist and the metallurgist is necessary. Historians, he said, had always recognised the great debt which the chemist owed to the metal refiner and extractor, and in more recent times that debt was being repaid inasmuch as the practical metallurgist was making use of the knowledge gained from the chemist to improve his processes or devise new ones. Metallurgical science was essentially the application of physics and chemistry to the special case of metals, and the corresponding metallurgical art was founded more and more deliberately, as the industry advanced, upon the science. It was in the domain of physical chemistry that the applications of known principles of metallurgy had been most fruitful; on the other hand, the physical chemist had a rich field for study in the ascertained facts of metallurgical experience in enabling him to study chemical equilibria, because most processes in the smelting of metals depended upon chemical balance.

Dealing with alloys, Dr. Desch said it was in this field that the influence of physical chemistry had been most conspicuous, important advances having been made under scientific guidance, striking practical use being made of the discovery of new ideas, the application often following rapidly on the discovery, whether in pure physics or pure chemistry.

After giving a few typical examples of the relation of physical chemistry to work on metals, Dr. Desch said he wished to emphasise the point that these applications were not merely on the academic side. The industry was actually guided by physico-chemical principles, and that applied especially to that branch of metallurgy which dealt with the newer steels. All the important steel works had their own research laboratories equipped on a scale rarely found elsewhere, and in these laboratories physical and physico-chemical experiments were continually being carried out of a very high order of accuracy and delicacy, and the manufacture of steels was being carried on by the use of microscopic methods, thermo-chemical methods and magnetic methods. Thus the application of physical chemistry to metallurgy was not merely of academic interest.

Oil and Colour Chemists

Experiments on the Measurement of Colour

AT the December meeting of the Oil and Colour Chemists Association, held at the Birkbeck College, London, on December 15—Dr. Newton Friend, President, in the chair—a paper by Dr. T. Martin Lowry and Mr. L. P. McHatton, entitled "Further Experiments on the Measurements of Colour," was read by Mr. McHatton.

The author referred to a previous paper in which measurements were given of the densities of a number of slides from a Lovibond Tintometer set. The two principal series of measurements were shown in two figures, in which there were given (1) complete absorption-spectra (density / wave length) for a red, blue and yellow slide of correspondingly density (No. 10 of each series), (2) curves showing the relationship between the density and serial number of complete series of red, blue and yellow slides.

In the course of this work it was noticed that in a few cases filters bearing consecutive numbers had identical densities at the wave-length of maximum absorption of light, and it was thought that this might be due to incorrect numbering. Further investigation has, however, revealed a different origin for this discrepancy, since it was found that although these filters had equal densities at the wave-length of maximum absorption of light, they were not equal when examined with white light. The discrepancy to which attention was called must therefore be attributed to the fact that the absorption curves vary in a somewhat irregular way from one number to another in a series of filters, perhaps because when using different meltings of glass it was necessary to use different thicknesses in order to produce a given density in the filter.

The absolute value of the numerical sale of densities selected by Lovibond was determined by putting together three filters of equal number so that the transmitted light was colourless. When tested in the spectrophotometer against white light, the density of the combination of three No. 10 slides was 1·5 A total Lovibond number of 30 was therefore equal to a density of 1·5 and each unit on his numerical scale was therefore equivalent to a density of about 0·05.

Measurement of Fading

Mr. A. D. Lang then exhibited a daylight lamp, and showed the differences between matching colours by such devices and by the ordinary electric incandescent lamp. With regard to the fadeometer, he said that the object of the apparatus was to be able to test artificially how materials fade, so that the qualities can be ascertained at times when no sunlight is available. He had experimented with three cakes of soap—of pink, violet and blue colours, and found that in 50 minutes they were bleached white.

Colouring for Poisons

THE desirability of using distinctive colouring for poisons forms the subject of correspondence between the Privy Council and the Pharmaceutical Society. The Privy Council wrote asking whether the proposal was a practicable and useful one. The Society replied that the council of the Society had referred the question of its practicability from a pharmaceutical point of view to the codex committee. The codex committee reported that as a tentative and experimental regulation the B.P. solution of strychnine hydrochloride might receive colour to the extent of 0.004 part by weight of brilliant green in 100 parts by volume of the solution. They recommended the use of brilliant green in preference to methyl violet as being more distinctive. The action of reagents on the dye was not likely, in their opinion, to prove inconvenient to dispensers or to the public.

This report was sent to the Privy Council with an intimation that the council of the Society had accepted the suggestion.

Indian Dyestuff Imports

IN the course of a review of the import trade of India for the first half of the statistical year, April 1 to September 30 last, H.M. Senior Trade Commissioner in India states that the total imports of dyestuffs obtained from coal tar fell from 147 to 127 lakhs. Germany now supplies over one crore, or approximately 80 per cent. of the trade. The British shipments fell from 49 to 10 lakhs, those from the United States from 22 to 4 lakhs, and Swiss imports were reduced from 8 lakhs to a negligible quantity.

Disinfectants in Green Bottles

The Stability of Hypochloric Preparations

IN the High Court, on Tuesday, the Milton Manufacturing Co., Ltd., of Bunhill Row, London, were sued by Mr. Frederick Algernon Langley, merchant, of the Borough, London, who claimed damages for breach of an agreement under which he undertook to market the defendants' disinfectant Milton in Chile, Ecuador, Bolivia, and Peru. He also claimed damages for breach of warranty as to the quality and strength of 230 cases of the disinfectant shipped to those States in 1920. The claim also included charges for disbursements, services rendered, and advertising, the total being £1,865. According to the plaintiff's case, when the disinfectant arrived it was not of the quality or strength represented. It was so weak that it would not comply with any of the tests specified, and in fact was more than 40 times weaker than Milton of normal strength.

Counsel for the plaintiff read a letter from the defendants regretting that owing to unavoidable circumstances the disinfectant had been put into green instead of brown bottles, and as green glass was not non-actinic the stability of a hypochloric preparation might be interfered with. They accordingly offered to send out another supply, but refused to pay the claims made by plaintiff.

Counsel for the defence argued that there was no warranty. The contract was f.o.b., London, and the disinfectant was perfectly good when shipped. The company had sold over £20,000 worth of Milton in green bottles without a complaint.

Mr. Charles Wade, the defendants' works manager, said the stock in question was made specially for the plaintiffs, and all records showed that it was of adequate strength when it went out.

Mr. Justice Branson, in giving judgment, said he was of opinion that there was a contract, and that the defendants had broken it. There was an implied warranty that the material was reliable, and it was not necessary to find out whether the failure of it was due to the way in which it had been put up, or to the character of the bottles. After going through the various items of claim and deductions asked for by the defendants, his Lordship gave judgment for the plaintiff for £1,630, with costs, and granted a stay on the usual terms.

Manufacture of Synthetic Toluene

Wartime Work at Whitehaven

MR. F. C. MARCH, 18, Belgrave Road, London, who has been interested in a secret process for the manufacture of synthetic toluene and also in concessions for mining uranium, attended before Mr. Registrar Francke at the London Bankruptcy Court, on December 15, for his public examination on a statement of affairs in which he returned his liabilites at £10,179, of which £4,181 were expected to rank, and an estimated surplus in assets of £10,735. Examined by the Official Receiver, the debtor said that in August, 1911, he assisted in the formation of a company called Harding Brothers (Engineers) Westminster, Ltd., which took over and continued an existing business, and on behalf of which he acquired in 1912, 13 concessions on uranium bearing properties in Vizeu, Portugal. He acted as a director of the company until a winding up order was made against it in June, 1920. In September, 1913, also on behalf of Harding Bros., Ltd., he assisted in the formation of a company called British and Foreign Enterprises, Ltd., with a nominal capital of £20,000, with a view to its promoting an international combine which should take over the concessions of Harding Bros., Ltd., and the Portuguese Mining Syndicate, Ltd., and also to acquire the Ebler process for extracting radium from its ores, but nothing came of it. In June, 1915, he assisted in the formation of a public company called the Toluene Syndicate, Ltd., with a nominal capital of £2,000, which took over from Harding Bros., Ltd., their secret process for the manufacture of a synthetic toluene, which it contracted to supply to the Government. Assisted by the Government the syndicate built and equipped a factory at Whitehaven, but in consequence of the failure in the supply of a necessary chemical, the toluene could not be produced. Acetone was, however, manufactured and supplied until the Armistice. The examination was adjourned.

Chemical Matters in Parliament

Colouring of Poisons

In reply to Mr. Doyle (House of Commons, December 13), Mr. Bridgeman said that the investigations as to the practicability of employing distinctive colours for poisons in the form of powder, such as arsenic or strychnine, had not yet been completed, and that no statement on the matter could be made at present.

Chemical Warfare

Lieut.-Colonel Guinness informed Mr. Trevelyan (House of Commons, December 14), that he was not in a position to give the figures of expenditure incurred in the last financial year in Britain and in France for experiments directed to the preparation and perfecting of chemical warfare; the number of public and private laboratories in which such experiments were being made in Britain and in France with official sanction; and the number of persons employed in those experiments.

Leeds Chemical Works Explosion

Conclusion of Board of Trade Inquiry

A SPECIAL Court of Inquiry set up by the Board of Trade to ascertain the cause of the fatal explosion which occurred at the Holme Street, Leeds, works of Brotherton and Co., Ltd., on July 31 last (*see* THE CHEMICAL AGE, Vol. VII, p. 173) opened its inquiry at Leeds Town Hall on December 13, the hearing of evidence occupying in all seven days. It will be recalled that two men lost their lives as the result of the bursting of a large ammonia still. Evidence called on behalf of Brotherton and Co., Ltd., tended to show that the accident was caused by gas from volatile oils which found their way into the still, and that, when the explosion occurred, the still was torn away from its base, and so collapsed. Mr. G. C. Vaux, representing the Board of Trade, sought to show that the accident was not so much the result of excessive pressure as of corrosion and other faults in the supporting stays of the still, which was 19 years old.

Evidence for the Firm

At Tuesday's hearing evidence was given by Mr. C. A Fearnley, works chemist at the Holme Street works, and others; and Mr. C. Scriven, on behalf of Brotherton and Co., said that the firm had done all they could to assist in ascertaining the facts, and they were as anxious as were the Board of Trade to know the causes of the explosion. In view of the fact that crystals were found in the dome of the still after the explosion, he submitted that the Court must discount the suggestion that any increase in steam pressure was the cause of the disaster. An increase of steam pressure big enough to burst the still must inevitably have vaporised the crystals. It seemed reasonable to assume, therefore, that the gas pressure was the primary cause.

Giving judgment, Mr. A. A. Hudson said the Court found that the cause of the explosion was the breakage of the supporting stays. The suggestion that the explosion was due to a sudden volatilisation of oils in the still was not accepted. The Court found that the company was chiefly responsible, as the still was not under proper engineering supervision and it had been used for a pressure far beyond that for which it was built. The company was ordered to pay £200 towards the cost of the inquiry.

Heavy Chemical Trade Wages

Reduction Proposals Postponed for Three Months

A MEETING of the Joint Industrial Council for the Chemical Trades was held on Tuesday at the Ministry of Labour Headquarters in London to continue the discussion of a proposal to reduce wages in the heavy chemical trades on December 31. The Conference began at 11.30 a.m., and was continued for a short time after lunch. At the close, Mr. W. T. Kelly, a prominent official on the worker's side, informed a representative of THE CHEMICAL AGE that it had been decided to postpone the present proposals for a period of three months.

Improving Demand for Nitrate of Soda

New Prices fixed by Producers' Association

IN their nitrate market report, dated December 19, Aikman (London), Ltd., state that since December 4 the arrivals amount to about 69,000 tons, and about 35,000 tons are due during the next fortnight. The market has continued to broaden during the fortnight, with a steady inquiry in practically all European consuming centres, and a general feeling of optimism as to the prospects of the coming season's consumption is becoming apparent. More business has taken place in cargoes than for a long time past, and includes liner parcels for December arrival at 12s. to 12s. 3d.; December shipment, 12s. 3d. to the parity of 12s. 5¼d.; and January–February shipment at 12s. 2d. to 12s. 4½d. per cwt., c.i.f. Two November sailing cargoes were also sold at 12s. 3d. and the parity of 12s. 5¼d., and a large December steamer cargo at 12s. 6d. per cwt., c.i.f., basis Bordeaux-Hamburg range. Prices in consuming markets have also been raised to the parity of £12 10s. to £13 5s. per ton, according to market, but even at these rates are well below the cost of combining on the Association prices. The Producers' Association have effected considerable sales during the fortnight, amounting to about 123,000 tons, of which about 58,000 tons to Europe and 65,000 tons to American buyers. Their total sales for shipment after July 1, 1922, thus amount to about 1,220,000 English tons. At a meeting of the directorate of the Producers' Association, held in Valparaiso on December 14, it was decided to raise prices for May–June, 1923, shipment to 20s. 8d. (9s. 6·08d. per Spanish quintal) for May 1 to June 15 delivery, and 19s. 1d. per metric quintal (8s. 9·34d. per Spanish quintal) for June 16–30 delivery. These compare with 19s. 7d. for May and 18s. 6d. per metric quintal for June delivery fixed originally.

Polishing Vulcanised Rubber Articles

IN the course of a paper on "A Bigger and Better Rubber Sundries Trade," read before the Manchester Section of the Institution of Rubber Industry on Monday, Mr. Fordyce Jones referred to a simple method of applying a polish to vulcanised rubber articles. More or less expensive enamels, chloride-cured starch, dull and polished finishes, casein, condensed milk and spirit varnishes had been used, but for many purposes, he thought, this idea was simpler and more economical in cost and application than any. The varnish was a water one, made by boiling equal weights of bleached white shellac and borax in distilled water for a sufficient period. The water varnish was allowed to settle, was skimmed, and was then carefully strained and thinned down with distilled water to the required consistency. It might be coloured with the aid of dyes, and filling agents added. This polish, he continued, was waterproof to a high degree, but a little gum arabic might be added with some fillers; it also simplified the application of the varnish in some cases. It would give a brilliant polish by simply being brushed on, or by dipping the articles into it, and it did much to enhance the appearance of rubber sundries. There was much room for profitable research work and practical application along these lines, and he was surprised that rubber technicians had not given the point more study.

University Professors and British Chemicals

THE position in which professors of chemistry are placed in regard to the purchase of chemicals for use in University laboratories was discussed by Dr. F. S. Kipping, Professor of Chemistry at University College, Nottingham, in an interview with a *Nottingham Guardian* representative. The professor of chemistry, stated Dr. Kipping, naturally wanted to encourage British industries, but he had also to consider the cost in relation to the finances of the institution concerned. The University College had not purchased more than £2 worth of chemicals direct from Germany since the war. British manufacturers were now making a great number of fine chemicals of quite good quality, and even if the rarer sorts could not be obtained from those sources, it was possible to make them in the college laboratories from the cruder products supplied by commercial firms, utilising the more advanced students for that purpose.

From Week to Week

MR. W. J. U. WOOLCOCK has been elected a Fellow of the Chemical Society.

FREE IMPORTATION of Chilean nitrate has been authorised by the Central American Republics.

A PAPER on Benzbisthiazoles, Part I, by S. R. H. Edge, was read at a meeting of the Chemical Society on Thursday.

THE 1923 PHOTOGRAPHIC FAIR, which will be held from March 15 to 24 inclusive, is to be housed in Holland Park Hall, London.

G. H. BEAL, LTD., thermometer manufacturers, have removed from 82, Turnmill Street, London, to 77, St. John Street, Clerkenwell.

PERMISSION to extend the hours of working from eight to nine hours per day has been granted to the German dye factories at Leverkusen.

PART of an upper floor at the premises of F. Newbery and Sons, wholesale druggists, City Road, London, collapsed without warning on December 14.

SIR ALFRED MOND, M.P., was elected a director of the Power Gas Corporation, Stockton-on-Tees, at the company's annual meeting on December 14.

IT IS REPORTED that Herr Kempner, president of the German Potash Combine, is on a visit to the United States to negotiate contracts with American consuming groups.

PRESIDING on Monday at the annual meeting of the Arizona Copper Co., Ltd., Mr. George Readman said that the conditions in the copper industry still left much room for improvement.

CONSEQUENT upon a settlement of the wages dispute at the lead works of Foster, Blackett and Wilson, Ltd., lead manufacturers, Hebburn, between 50 and 60 men have resumed work.

RICHARDSON'S CHEMICAL MANURE CO., Short Strand, Belfast, have reopened their works which have been closed during the past two months owing to a dispute with their workmen.

SIR CARL MEYER, a director of the Cape Explosives Works, Ltd., and a number of mining companies, died on Monday at 12, Park Crescent, London, W., after an illness of three months' duration.

DONELLY BROTHERS, have applied to the Lanarkshire County Council for permission to establish a bone degreasing business adjoining the works of the Braidwood Manure Co., Ltd., at Braidwood, Carluke.

A SCHOLARSHIP has been awarded by the governors of Queen Elizabeth Grammar School to Henry John Wade, son of Mr. H. J. Wade, of H. J. Wade and Co., Ltd., manufacturing chemists, Blackburn.

ON TUESDAY the General Board of Studies at Cambridge University were authorised to appoint a Reader in Biochemistry on Sir William Dunn's foundation, with a stipend of not more than £850 per annum.

AN AUSTRIAN CHEMIST is reported to have invented a process for the synthetic production of medicinal camphor of the composition $C_{10}H_{16}O_1$ as it is found in nature. A factory is being erected in the Tyrol to work the process.

THE YORKSHIRE COPPER WORKS, LTD., Leeds, who have hitherto been represented in London by Messrs. F. S. Dudgeon and Havart, have opened new offices of their own at 53, New Broad Street, E.C.2, under the charge of Mr. Kenneth P. Symes.

TWENTY MEN were injured, one seriously, at an explosion on December 14, at the Beckton works of the Gas Light and Coke Co. The seat of the explosion was apparently the main pipe of a new turbo-exhauster, but the cause is as yet unknown.

AN AGENCIA AMERICANA MESSAGE from Buenos Aires states that the Chambers of Commerce of the principal industrial centres of Argentina are petitioning the Government to take adequate measures for preventing the exportation of metallic ore.

ACID MANUFACTURERS in the United States have requested, through the Manufacturing Chemists' Association, that the railways should pay more for the use of owners' tank wagons. The American Petroleum Institute is also complaining in regard to privately-owned oil tank wagons.

AN AGITATION is reported to have been started by Japanese zinc manufacturers with the object of raising the tariff on zinc for the protection of the domestic industry, but the realisation of the end in view is thought doubtful. They contend that the present duty of 3 yen per 100 kin should be altered to 7 yen.

IT IS ANNOUNCED that Sir Thomas Robinson, M.P., has been appointed chairman, and Mr. R. Waddington, M.P., and Professor G. T. Morgan members of the Dyestuffs Advisory Licensing Committee to fill the vacancies due to the resignations of Sir Harry V. Kilvert, Mr. G. W. Currie, and Dr. M.O. Forster.

AFTER AN INVESTIGATION into the keeping qualities of calcium arsenate, the American Bureau of Chemistry are of the opinion that no practical possibility exists of change in the chemical composition of calcium arsenate during storage. The tests have included storage in all kinds of containers, and have extended over a period of six years.

A RESOLUTION urging the Government to compel Germany to pay a portion of her reparations to this country in the form of high-grade potash, was passed at a meeting on December 14, of the Ormskirk branch of the National Farmers' Union. It was stated that potash was urgently needed by farmers in order to restore their land to its pre-war condition.

NOTICE IS GIVEN by the Railway Rates Tribunal that the railway companies have submitted provisional proposals in respect of minimum distances and charges, mileage gradations, form of schedules, etc. The tribunal is prepared to consider objections which the Traders' Co-ordinating Committee may lodge, and persons interested are invited to communicate with that body.

THE INTERNATIONAL FOUNDRY TRADES EXHIBITION will be held in Birmingham in the early summer of 1924. The arrangements will again be in the hands of the Birmingham Chamber of Commerce and the British Cast Iron Association. The next exhibition will, it is hoped, be more international in character than was the exhibition held this year, which was the first of the kind to be held in the country.

IN A COMMUNICATION to the *Revue Scientifique*, Professors Béhal, Haller and Moureu urge the necessity of establishing some kind of protective measure to prevent German chemicals entering France. They point out that such measures have been established in the United States, England, Italy, and Japan, and they believe that prompt action of a similar kind is necessary if French chemical factories are to remain in operation and French chemists in employment.

ACCORDING TO the Berlin correspondent of *Fairchild's Bulletin*, the discovery of a substitue for synthetic silk, equal in every respect to genuine silk, was announced by Professor Herzog, director of the Dahlem Research Laboratory, at the opening of a new department of the Emperor William Institute of Science, devoted to the chemical treatment of textile fibres. The manufacturing process will, it was stated, involve less waste of raw material, and less intensive methods of washing, bleaching and carding.

Mr. A. W. TAIT has become a director, and has been appointed deputy chairman of the British Cellulose and Chemical Manufacturing Co., Ltd. It is also announced that the board of Nobel Industries, Ltd., has agreed to Sir Josiah Stamp joining the board of the Cellulose Co. for the time being in succession to Mr. Arthur Chamberlain, to assist in the internal financial organisation. Sir Josiah Stamp has been appointed to the board of Nobel Industries, Ltd., in succession to the late Mr. K. L. C. Prescott.

ACCORDING to Professor Mallet, France requires in time of war 150,000 tons of alcohol per annum, with an equal quantity of benzole for explosives. In addition, the requirements of liquid fuel amount to 700,000 tons. The estimated sources are from gas works 20,000 to 25,000 tons, from existing coke ovens a like amount, and from compulsory coking of all coals 50,000 to 60,000 tons. Hydrogenation of heavy oils might yield 100,000 tons, but the discovery of new methods of making light hydrocarbons would be very acceptable.

NEW SALTWORKS are to be erected in the New Year by the British Soda Co. at Elton, Sandbach. Rock salt is reported to have been found 230 ft. below the surface and a large quantity of saturated brine has been proved to be present. It is anticipated that the works will be erected by the summer, and at the outset 60 men will be employed. The plant will be capable of dealing with 100 tons of salt per day. The brine will be pumped through purifiers into multiple effect vacuum evaporators, where it will be crystallised into the state required for the market.

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Relation of hydrogen-ion concentration to filter-plant operation. W. D. Hatfield. *J. Ind. Eng. Chem.* November, 1922, pp. 1038–1040.

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German

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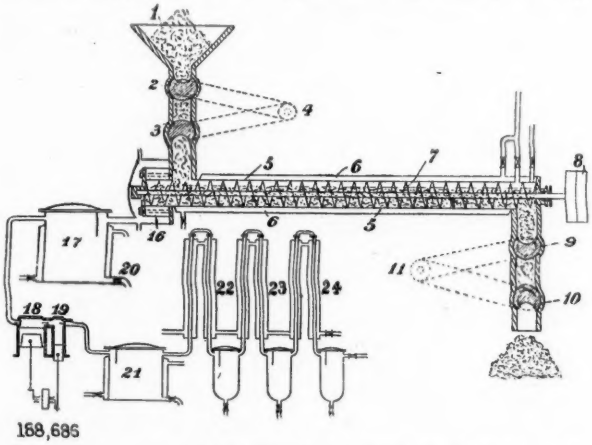
CARBON BISULPHIDE.—The formation of carbon bisulphide by the action of sulphur dioxide on carbon. B. Rassow and K. Hoffmann. *J. prakt. Chem.* October, 1922, pp. 207–240.

Patent Literature

Abstracts of Complete Specifications

188,686. Hydrocarbons from Wood, Shale or the Like, Extraction of. Plauson's (Parent Co.), Ltd., 17, Waterloo Place, Pall Mall, London, S.W.1. From H. Plauson, 14, Huxter, Hamburg, Germany. Application dates, May 17, and August 8, 1921.

In this process, which is suitable for large scale operations, shale or wood is treated with a non-oxidising gas under a partial vacuum at a high temperature, without external heating. In an example, shale containing about 2 per cent. of oil is supplied from a hopper 1 through rotary feeding



188,686

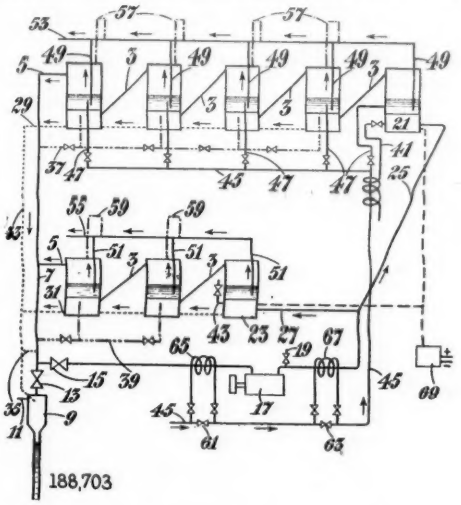
valves 2, 3 to a jacketed chamber 5 provided with a helical conveyor 7. Steam superheated to 350°–450° C. is supplied to the outlet end of the chamber 5 and passes in counter-current to the shale. The steam is preferably mixed with 0·1 to 1 per cent. of hydrogen or purified water-gas, and a partial vacuum of about 60–70 mm. of mercury is maintained in the chamber by means of a pump. The steam and products of distillation pass through a filter 16 to a jacketed cooling chamber 17, in which the hydrocarbons are condensed. The filter 16 may be of annular form, and its inner surface may be cleaned by the helix 7. The remaining vapour is compressed by a pump 19 to atmospheric pressure, and then expanded in a cooling vessel 21, in which oil and water are separated. The remaining hydrocarbon vapours are recovered in condensers 22, 23, 24. The solid residue is withdrawn through rotary valves 9, 10. About 14 per cent. of hydrocarbon oil having a boiling point of 80°–170° C., and free from sulphur, is obtained. Wood may be treated in a similar manner with steam at 250°–350° C.

188,723. Recovery of Gases or Vapours from Charcoal or other Absorbent Substances. E. R. Sutcliffe, 93, Church Street, Leigh, Lancs, and H. S. Raper, 5, North Parade, West Park, Leeds. Application date, July 16, 1921.

In the usual process for absorbing gases in charcoal and recovering them by means of steam, it has been found that the condensation which occurs prevents further use of the charcoal without a regenerating treatment. It is now found that this disadvantage is avoided by the use of superheated steam. The charcoal is first subjected to the action of steam at 300° C., and at atmospheric pressure, which displaces the absorbed gas completely, but without overheating. This treatment may be continued until the temperature of the steam leaving the charcoal has risen to 110° C., which ensures that the charcoal contains no condensed moisture. The temperature at the inlet end is then about 300° C., and this is reduced to about 100° C. by passing saturated steam through it at about 100° C. in the same direction. This is continued until the temperature of the steam at the outlet is still a few degrees above 100° C. Any condensation in the charcoal is thus avoided, and its temperature is such that it is again ready for the absorption of vapour.

188,703. Heating or Cooling of Liquids or Admixed Solids and Liquids in Evaporative or Like Treatment, Method of and Apparatus for. T. Rigby, 72, Victoria Street, Westminster, London, S.W.1. Application date, June 16, 1921.

A multiple effect evaporator has a connection between the vapour space of the last effect and the heating space of the first effect, while the vapour from the last effect is compressed and rendered available for heating the first effect. The illus-


188,703

tration shows a combination of two multiple effect plants each comprising a small number of effects. The vapour space of one effect is connected to the heating space of the next effect by pipes 3, and the vapour is withdrawn from the last effects by pipes 5, 7 leading to a barometric condenser 9, or alternatively through a valve 15 to a compressor 17, which discharges the compressed vapour through pipes 25, 27 to the two plants. The condensate from all the effects is drawn off by pipes 29, 31, 33 to the barometric condenser, and the non-condensible gases are drawn off from the heating spaces by pipes 37, 39, and 7. The material to be evaporated is supplied in parallel to the various effects by pipes 45, 47, and the concentrate is drawn off in parallel by pipes 49, 51. The heat of the material drawn off is used to preheat the incoming material.

188,786. Absorbents and Adsorbents of Condensible Gases and Vapours, Manufacture of. B. Lambert, 197, Woodstock Road, Oxford. Application date, August 18, 1921.

The object is to obtain a granulated iron oxide preparation, which is hard and highly porous, and which is suitable for the absorption and adsorption of condensible vapours such as those of hydrocarbons, halogen substituted hydrocarbons, alcohols, ethers, esters, ketones, etc. A solution of ferric chloride is mixed with caustic soda, which precipitates iron hydroxide gel. The mixture is allowed to settle, and the precipitate washed with water, filtered and dried. The drying is effected at 26°–36° C., when it becomes hard and brittle and may be granulated. The product is then heated to 110°–160° C., in a current of air or *in vacuo*, to dehydrate it. This material is capable of removing readily condensible vapours from air, and the absorbed substances may be recovered by heating the absorbent in a current of steam to a temperature above 100° C.

188,807. Carbon, Production of. A. M. Hart, 18, Hilltop Road, West Hampstead, London, N.W.6. Application date, August 24, 1921.

The process is for carbonising materials such as peat, lignite, sawdust, cotton or paper refuse, or the like. The material is first treated with a 1 per cent. solution of sodium carbonate, or other sodium or potassium salt such as the sulphate,

chloride, acetate or phosphate. The mixture is then roasted with free exposure to the air until completely carbonised. If a pure carbon is required, the product may be boiled with dilute hydrochloric acid and then dried. The process is applicable to the carbonisation of wet peat.

188,854. COLLOIDAL SULPHUR, MANUFACTURE OF. Plauson's (Parent Co.), Ltd., 17, Waterloo Place, Pall Mall, London, S.W.1. From H. Plauson, 14, Huxter, Hamburg, Germany. Application date, September 23, 1921.

Specification No. 155,836 (see THE CHEMICAL AGE, Vol. IV., p. 313) describes the manufacture of colloidal sulphur by subjecting solid sulphur to intensive disintegration with water, but it is found that a maximum concentration of sulphur of only 3 per cent. can be obtained in this manner. It is further found that the usual protective colloids, such as gelatin, sugar, glycerin or casein do not act as satisfactory dispersators. In this invention dispersators are used containing sulpho groups such as sulpho derivatives of fatty acids, naphthene sulphonic acids, sulphonated castor oil acids (turkey red oil), thionic acids or purified sulphite cellulose liquor. In an example, a solution of sulphur and carbon bisulphide is emulsified with water and turkey red oil, yielding a white colloidal sulphur dispersion. To obtain solid colloidal sulphur, gelatin may be added and the mill connected with a vacuum pump to evaporate the solvent. The resulting jelly may be dried *in vacuo* and is a reversible colloid soluble in water. The solution may be concentrated by ultra-filtration or electro-osmosis. Another example of the production of a stable sulphur sol from solid sulphur is given.

188,865. EXTRACTING METALS FROM ORES WITH NITRIC ACID, METHOD OF. J. S. Wetzlar, 1, Nutley Terrace, Fitzjohns Avenue, London, N.W.3. From H. Pauling, Hagenstrasse 28, Grunewald, Berlin. Application date, September 29, 1921.

The process is for expediting the extraction of metals from mixed ores with nitric acid. The ore is crushed and mixed with iron or iron compounds in such proportion that the iron content is chemically equivalent to the total metals other than iron. This mixture is digested under heat with nitric acid of at least 40 per cent. strength. The temperature towards the end of the reaction is raised to about 80°–100° C. by injecting steam, and it is found that a quicker extraction of the metals is thus obtained. This is attributed to the fact that the ferrous nitrate first formed becomes broken up by hydrolysis, liberating free nitric acid and iron hydroxide in proportion to the amount of nitric acid absorbed by the other metals. Any tin present in the ore remains as a residue and may be extracted by known methods while lead may be separated from the solution by adding the equivalent amount of sulphuric acid to precipitate lead sulphate. Silver may be recovered by precipitating with copper. The solution of nitrate may be treated with sulphuric acid, which precipitates the sulphates almost completely and regenerates concentrated nitric acid. Alternatively, these metals may be recovered by cementation with iron, in which case ferrous nitrate is produced and may be used with free nitric acid for extracting a fresh charge of ore. Alternatively, the metals may be recovered by electrolysis.

188,868. METALS AND ALLOYS INSOLUBLE OR ONLY GRADUALLY SOLUBLE IN SULPHURIC ACID, METHOD OF TRANSFORMING INTO SULPHATES, BY THE ACTION OF NITRIC ACID. J. S. Wetzlar, 1, Nutley Terrace, Fitzjohns Avenue, London, N.W.3. From H. Pauling, Hagenstrasse 28, Grunewald, Berlin. Application date, September 30, 1921.

The metal is treated with nitric acid to obtain the nitrate but the reaction is stopped as soon as it begins to slow down. The necessary quantity of sulphuric acid of 80 per cent. strength is then added, and air is blown through it to remove the remaining oxides of nitrogen. This reaction produces a mixture of the metal sulphate and strong nitric acid, so that the air current removes only nitrous gases and strong nitric acid vapour. These are treated in an absorption plant and nitric acid of an increased strength is recovered. The liquor is cooled and crystals of sulphate are deposited and are separated, washed and dried. The remaining liquor consists of strong nitric acid with small proportions of sulphate, nitrate and sulphuric acid. When this process is applied to the preparation of copper sulphate from metallic copper, the whole process may be completed in about one hour and is thus much quicker than the older process in which sulphuric acid passes downwards through a tower containing the metal, while air and steam are blown in at the bottom. In the manufacture of nickel sulphate by this process, the concentration of the nitric acid and sulphuric acid must be calculated so as to allow seven molecules of water of crystallisation for the crystallised nickel sulphate. Other metals may be similarly treated.

188,928. LIGHT HYDROCARBON DISTILLATES FROM HEAVIER HYDROCARBONS, METHOD OF OBTAINING. D. W. Hovey, Shreveport, La., U.S.A. Application date, October 31, 1921.

The apparatus is for refining crude petroleum to obtain a larger proportion of lighter distillates, and for treating gas oil, fuel oil, and residues to produce an additional quantity of lighter distillates. In this apparatus, the oil is heated internally by superheated steam so that the unequal heating which occurs in externally heated stills is avoided. The horizontal cylindrical still is provided with transverse girders slightly above the bottom to support a structure of very porous bricks which extends nearly to the top. A number of horizontal heating coils are embedded in the brickwork, and are supplied with superheated steam which passes from a boiler through superheating coils in front of the still heated by an oil burner. The crude oil is forced by a pump into the still through a perforated distributing pipe extending longitudinally in the space above the brickwork. The temperature of the superheated steam is gradually raised to 900° to 1,000° F., and a pressure of 50–75 lbs. per square inch is maintained within the still. The percentage of gasolene in the products increases with the pressure in the still. The oil passes downwards through the porous brickwork, and the residue is drawn off from the space at the bottom of the still and may then be distilled to dryness in a separate still. The distillate from the latter may be returned to the pressure still and treated again. Crude oil treated in this apparatus may be distilled so as to yield about 45 per cent. of gasolene and 25 per cent. of kerosene. It is found that with this apparatus the amount of carbon deposited is very small, and is in the form of a very fine powder which does not adhere to the metal surfaces.

188,933. PHENYL GLYCINE COMPOUNDS, MANUFACTURE OF. British Dyestuffs Corporation, Ltd., Imperial House, Kingsway, London, W.C.2, and M. Wyler, Crumpsall Vale, Chemical Works, Blackley, Manchester. Application date, November 3, 1921.

Phenyl glycine compounds are produced from trichlorethylene and aniline by gradually adding one molecular proportion of trichlor-ethylene to slightly more than one molecular proportion of aniline and a substance such as milk of lime having an alkaline reaction. The temperature is kept at 170°–180° C.

189,013. REFINING LEAD. H. Harris, of The National Metal and Chemical Bank, Ltd., 70, Lombard Street, London, E.C.3. Application date, January 18, 1922.

In the process of refining lead by oxidising the metal impurities by means of air, it is found that a large proportion of the lead is oxidised simultaneously. In this invention, the impurities are oxidised by chemical oxidising agents such as alkali nitrate or nitrite, chlorate or hypochlorite, or a peroxide. These are dissolved or suspended in molten caustic alkali, or a molten mixture of caustic alkali and alkali chloride. The preferred oxidising agents are sodium nitrate and chlorate in fused caustic soda, with or without sodium chloride. The oxidation is preferably conducted by passing molten metal through the molten oxidising agent. In an example, 50 tons of crude argentiferous lead containing 0·25 per cent. of antimony are melted and passed through a molten mixture of caustic soda (72 per cent.) 850 lbs., and sodium chloride (95 per cent.), 600 lbs., to which sodium nitrate (95 per cent.), 200 lbs. is gradually added, the temperature being about 420° C. The antimony is extracted in an insoluble oxidised form and may be recovered by the solution of the other constituents in water. The lead is not dissolved, and may be obtained pure. If the lead contains tin and arsenic in addition, these are found in the solution, and may be recovered separately. In another example, the proportions of the oxidising reagent are so adjusted that 90 per cent. of the tin is selectively dissolved at 400° C., leaving the arsenic

and antimony in the lead. The metal is now treated with a fresh molten mixture of different proportions, which extracts most of the arsenic and the remainder of the tin, at a temperature of 400° C. The metal is then treated with another molten mixture at 420° C., which extracts the antimony without dissolving any lead. It is found that an oxidising mixture containing sodium chlorate is more easily controlled than one containing the nitrate but is more expensive.

188,376. AROMATIC CYAN MERCURY COMPOUNDS, PROCESS OF PRODUCING. A. Klages and Saccharin-Fabrik Akt.-Ges. vorm. Fahlberg, List and Co., Alt Salbke, 57-63, Magdeburg-Südost, Germany. Application date, August 4, 1921.

Complex mercury compounds of phenols are usually highly unstable and not readily soluble, but it is now found that these compounds can be transformed into highly stable and soluble compounds by treating with alkali cyanides. Alternatively these products may be obtained by heating an alkaline solution of a phenol with mercury cyanide, or by heating phenols with mercuric oxide and alkali cyanides. The alkaline salt of the aromatic cyanide compound is thus obtained, and the free aromatic cyanide mercury compound is precipitated by dilute acid. Examples are given of the production of phenol and cresol compounds of mercury cyanide. These compounds are particularly effective for treating diseases of wheat and other crops.

NOTE.—Abstracts of the following specifications which are now accepted appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention: 163,047 (Nitrogen Corporation), relating to preparation of mixtures of nitrogen and hydrogen for the production of ammonia, see Vol. V., p. 76; 167,156 (W. Mau), relating to manufacture of concentrated hydrogen peroxide solution, see Vol. V., p. 412; 171,972 (L'Air Liquide Soc. Anon pour l'Etude et l'Exploitation des Procedes G. Claude), relating to synthesis of ammonia, see Vol. VI., p. 117; 172,944 (Aktieselskabet Labrador), relating to precipitation of iron in mineral acid alumina solutions, see Vol. VI., p. 209; 184,795 (J. Ephraim), relating to production of sulphides and hydrosulphides of the alkali metals, see Vol. VII., p. 570. 163,046 (Nitrogen Corporation), relating to the production of catalysts, see Vol. V., p. 76; 169,990 (G. Freydier-Dubreul), relating to a process and apparatus for treating compound minerals, see Vol. V., p. 709; 171,970 (L'Air Liquide Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude), relating to the synthesis of ammonia, see Vol. VI., p. 117; 175,649 (H. Egeling), relating to saturators for use in the recovery of salts from the gases of dry distillation, see Vol. VI., p. 563.

International Specification not yet Accepted

189,074. METALDEHYDE, MANUFACTURE OF. Elektrizitätswerk Lonza, Gampel and Basle, Switzerland. International Convention date, March 9, 1922.

Metaldehyde is stabilised by mixing a very small proportion of ammonium carbonate with it. The rate of decomposition decreases as the proportion of ammonium carbonate is increased.

LATEST NOTIFICATIONS.

190,109. Vertical distillation retort for the distillation of schists bituminous materials, brown-coal, and the like. Razen, Schaefer, et Cie. Ges. December 7, 1921.

190,114. Process and apparatus for the manufacture of acid H. (amino-naphthol-disulphonic 1.3.6.8.). Poma, G., and Pellegrini, G. December 12, 1921.

190,115. Process for removing hydrogen sulphide and other impurities from gases and liquids. Koppers Co. December 8, 1921.

190,116. Process and apparatus for removing hydrogen sulphide from gases. Koppers Co. December 8, 1921.

190,117. Method and apparatus for purifying gases. Koppers Co. December 8, 1921.

190,118. Manufacture of hydrogen sulphide. Koppers Co. December 8, 1921.

190,119. Process and apparatus for purifying gases. Koppers Co. December 8, 1921.

190,123. Process of manufacture of the calcium salt of acetyl salicylic acid. Soc. Chimique des Usines du Rhone. December 6, 1921.

190,148. Capillary process of exchange of liquids, applicable to chemical reactions, photography, dyeing, tannery, and the like. Lumiere, L. December 7, 1921.

190,174. Process for recovering the solvents used in the extraction of oil and fatty bodies. Soc. Générale d'Evaporation Procédés Prache et Bouillon. December 12, 1921.

Specifications Accepted, with Date of Application

168,887. Crucibles. Bellis Heat Treating Co. August 30, 1920.

184,153. Hydrogen peroxide, Manufacture of. Chemische Fabrik Weissenstein Ges. August 3, 1921.

187,232. Chrome-alum, Production of. Chemische Fabrik in Billwarder vorm. Hell und Sthamer Akt.-Ges., and P. Hasenclever. October 12, 1921.

189,475. Gas, Manufacture of. G. Helps. May 26, 1921.

189,523-4-5. Lithopone, Manufacture of. H. G. C. Fairweather. (*New Jersey Zinc Co.*). August 30, 1921.

189,542. Oil shales, coal, and other carbonaceous materials, Process of distilling—and apparatus therefor. T. G. Ironside, September 1, 1921.

189,561. Organic products obtained by the chlorination of cellulose materials, Process for dissolving by means of alkalis. A. R. de Vains. September 5, 1921.

189,692. Crucibles, retorts, and the like. Ferolite, Ltd., and H. B. Clapp. February 7, 1922.

189,698. Monazite and other phosphate ores, Method for the treatment of. Soc. Minière and Industrielle Franco-Bresilienne. December 29, 1921.

189,700. Titanium dioxide and vanadium salts from bauxite Process for the extraction of. E. E. Dutt. February 10, 1922

189,701. Solvents and oils, Clarifying of. N. E. Willis. February 13, 1922.

189,706. Finely divided substances, Process for the production of. T. Goldschmidt Akt.-Ges., and V. Kohlschutter. February 27, 1922.

189,723. Hydrochloric acid in aqueous solution, Plant for the synthetic manufacture of. G. Poma and G. Andreani. May 19, 1922.

Applications for Patents

Adam, W. G., Gas Light and Coke Co., Shannan, W. V., and Siderfin, N. E. Manufacture of organic compounds. 34368. December 16.

Badische Anilin- und Soda-Fabrik and Johnson, J. Y. Manufacture of vat colouring-matters. 34370. December 16.

Chapman, D. L., Taylor, R., and Tezard, H. T. Halogenation of hydrocarbons. 34168. December 14.

Chemical and Metallurgical Corporation, Ltd., and Elmore, F. E. Continuous process for conversion of lead chloride into sulphate and recovery of hydrochloric acid. 34397. December 16.

Davies, A. Carbonisation and/or gasification of fuels. 34066. December 14.

Dempster, Ltd., R. and J. Gas-diverting valve for gas-purifiers, etc. 34095. December 14.

Gardner, D., and Taverner, L. Extraction of titanium from ferro-titanium alloys. 34057. December 13.

Hambloch, A. Preparation of magnesium carbonate from magnesium carbonates and magnesium silicates containing calcium. 33798. December 11. (Germany, March 8).

Heyl, G. E. Distillation of hydrocarbons. 34121. December 14.

Hick, Hargreaves and Co., Ltd. Filters, etc. 33912. December 12.

Keenok Co., Ltd., Sonsthagen, A., and Wood, J. L. Emulsifying apparatus. 34142. December 14.

Lever Bros., Ltd., and Townsend, C. S. Preparation of shredded edible fats. 33901. December 12.

Mitchell, J. L. Lithopone products. 33786. December 11.

Short, E. G. M. Manufacture of nitrogen compounds. 34177. December 14.

Soc. Générale d'Evaporation Procédés Prache et Bouillon. Process for recovering solvents used in extraction of oil and fatty bodies. 33790. December 11. (France, December 12, 1921).

Stacey, F. Electric apparatus for production of peroxides of nitrogen. 34200. December 15.

Waterlow, E. O. Separation of water, etc., from tar. 34048. December 13.

Weidner, E. Production of albumose solutions. 33877. December 12.

Zdanowich, J. O. Manufacture of acetose and products therefrom. 34062. December 13.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

LONDON, DECEMBER 20, 1922.

THE markets have been surprisingly active, having regard to the near approach of the Christmas holidays. There are few price changes of importance, but the general tendency remains firm.

Much better export demand has been experienced, and quite a substantial volume of business has been completed.

General Chemicals

ACETONE is very scarce in all positions, and a further advance in the market is expected.

ARSENIC is difficult to obtain for any near delivery. Makers are sold out and available supplies are in strong hands.

ACID ACETIC.—There is no change in the market, the demand remaining steady.

ACID CITRIC.—A few weak sellers appear in the market from time to time. The volume of trade is negligible and the tendency uncertain.

ACID FORMIC is a fairly active market, and certain cheap sellers seem to have liquidated their commitments.

ACID LACTIC.—Unchanged.

ACID OXALIC.—Now that the chance of the removal of the duty has disappeared, the inland market is expected to improve. Stocks are practically non-existent.

ACID TARTARIC is being talked up in price on account of advance in the price of raw material.

BARIUM CHLORIDE.—Unchanged.

CREAM OF TARTAR is again lower in price; some aspects of the market are inexplicable.

FORMALDEHYDE is again firmer in price. Makers are sold for the next few months, and higher prices appear inevitable.

LEAD ACETATE is in fairly good demand; price unchanged.

LEAD NITRATE is without special feature.

METHYL ALCOHOL is very scarce indeed. Spot suppliers command their own price.

POTASSIUM CARBONATE remains uninteresting.

POTASSIUM CAUSTIC.—Unchanged.

POTASSIUM PERMANGANATE is a firm market; forward prices have advanced and stocks are light.

POTASSIUM PRUSSIATE.—Unchanged.

SODIUM ACETATE is rather higher in price, with makers sold out for the first three months of next year.

SODIUM PRUSSIATE.—Unchanged.

ZINC OXIDE is rather firmer, although there is no official notification of change in value.

Pharmaceutical Chemicals

ACETANILID continues firm.

ACID ACETYL SALICYLIC is in steady demand.

ACID SALICYLIC B.P.—There are now few offers below makers' prices.

ACID TANNIC LEVISS is in demand, the higher prices being for prompt delivery.

AMIDOPYRIN.—Some holders are quoting slightly lower prices.

BARBITONE has again advanced.

COCAIN HYDROCHLOR.—The tendency is firmer.

METHYL SALOCYLATE is in good demand.

SALOL.—The market is advancing.

VANILLIN.—Tendency is weaker.

Coal Tar Intermediates

Business has been rather slacker during the past week, and buyers tend to put off purchasing until after the holidays.

ALPHA NAPHTHOL continues firm, with steady inquiry in the market.

ALPHA NAPHTHYLAMINE is without special feature.

ANILINE OIL is a steady trade at makers' figure.

BENZIDINE BASE has been slightly more interesting on home account.

BETA NAPHTHOL is without change.

BETA NAPHTHYLAMINE.—A few home orders have been placed.

DIPHENYLAMINE is very firm.

G. SALT is quiet and easy.

H. ACID continues to be inquired for, and spot stocks are on the short side.

METANITRANILINE.—Some export business has been placed.

PARAPHENYLENEDIAMINE is a firm home trade.

SULPHANILIC ACID.—Some home orders are in the market.

Coal Tar Products

There is little change in our market since last week.

90% BENZOL has no great demand, although the price remains unchanged at 1s. 8d. to 1s. 9d. per gallon in the North, and 1s. 11d. to 2s. per gallon in London.

PURE BENZOL has a poor market. To-day's price in the North is about 2s. per gallon, and about 2s. 3d. to 2s. 4d. per gallon in London.

CREOSOTE OIL is steady, and prices are well maintained. It is worth from 6¾d. to 7d. per gallon on rails in the North, and 7¼d. to 8d. per gallon in the South.

CRESYLIC ACID is a poor market, and the dark quality 95/97% is worth about 1s. 6d. per gallon on rails, while the pale 97/99% is worth about 1s. 9d. to 1s. 10d. per gallon.

SOLVENT NAPHTHA is in fair demand, although the price remains easy at about 1s. 7d. per gallon on rails in the North and 1s. 10d. to 2s. per gallon in London.

HEAVY NAPHTHA has practically no market, and is worth about 1s. 6d. per gallon on rails.

NAPHTHALENE remains firm, without much new business, and crude drained and whizzed qualities are worth from £5 to £7 per ton according to melting point, while the hot pressed is worth £8 10s. to £9 per ton.

PITCH.—The improvement in the tone of the market indicated in our last report continues, and as stocks are at a very low point, buyers are anxious to get parcels for prompt delivery. To-day's quotations are 125s., f.o.b. East Coast, and 127s. 6d. to 130s. f.o.b. London.

Sulphate of Ammonia

The demand for export is fairly good, and there is no change in the home trade position.

Current Prices

General Chemicals

	Per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	1	5	to	0	1	7
Acetone oil	ton	80	0	0	to	82	10	0
Acetone, pure	ton	130	0	0	to	135	0	0
Acid, Acetic, glacial, 99–100%	ton	67	0	0	to	68	0	0
Acetic, 80% pure	ton	43	0	0	to	44	0	0
Arsenic, liquid, 2000 s.g.	ton	67	0	0	to	70	0	0
Boric, cryst.	ton	55	0	0	to	60	0	0
Carbolic, cryst. 39–40%	lb.	0	0	7	to	0	0	7½
Citric	lb.	0	1	9	to	0	1	10
Formic, 80%	ton	59	0	0	to	60	0	0
Hydrofluoric	lb.	0	0	7½	to	0	0	8½
Lactic, 50 vol.	ton	41	0	0	to	43	0	0
Lactic, 60 vol.	ton	43	0	0	to	44	0	0
Nitric, 80 Tw.	ton	27	0	0	to	29	0	0
Oxalic	lb.	0	0	7½	to	0	0	7½
Phosphoric, 1.5	ton	40	0	0	to	42	0	0
Pyrogallic, cryst.	lb.	0	5	9	to	0	6	0
Salicylic, Technical	lb.	0	1	0	to	0	1	2
Sulphuric, 92–93%	ton	6	10	0	to	7	10	0
Tannic, commercial	lb.	0	2	3	to	0	2	9
Tartaric	lb.	0	1	2½	to	0	1	3
Alum, lump	ton	13	0	0	to	13	10	0
Alum, chrome	ton	28	0	0	to	29	0	0
Alumino ferric	ton	9	0	0	to	9	5	0
Aluminium, sulphate, 14–15%	ton	10	10	0	to	11	0	0
Aluminium, sulphate, 17–18%	ton	11	10	0	to	12	0	0
Ammonia, anhydrous	lb.	0	1	6	to	0	1	8

	Per	£	s.	d.		£	s.	d.
Ammonia, .880	ton	33	0	0	to	35	0	0
Ammonia, .920	ton	21	0	0	to	23	0	0
Ammonia, carbonate	lb.	0	0	4	to	0	0	4½
Ammonia, chloride	ton	50	0	0	to	55	0	0
Ammonia, muriate (galvanisers)	ton	35	0	0	to	37	10	0
Ammonia, nitrate (pure)	ton	35	0	0	to	40	0	0
Ammonia, phosphate	ton	65	0	0	to	68	0	0
Ammonia, sulphocyanide	lb.	0	1	10	to	0	2	0
Amyl acetate	ton	175	0	0	to	185	0	0
Arsenic, white, powdered	ton	70	0	0	to	75	0	0
Barium, carbonate, 92–94%	ton	15	0	0	to	16	0	0
Barium, Chlorate	ton	65	0	0	to	70	0	0
Barium Chloride	ton	18	0	0	to	19	0	0
Nitrate	ton	35	0	0	to	38	0	0
Sulphate, blanc fixe, dry	ton	20	10	0	to	21	0	0
Sulphate, blanc fixe, pulp	ton	10	5	0	to	10	10	0
Sulphocyanide, 95%	lb.	0	1	0	to	0	1	3
Bleaching powder, 35–37%	ton	11	0	0	to		—	
Borax crystals	ton	28	0	0	to	32	0	0
Calcium acetate, Brown	ton	10	10	0	to	11	10	0
,, ,, Grey	ton	15	10	0	to	16	0	0
Calcium Carbide	ton	16	0	0	to	17	0	0
Chloride	ton	6	0	0	to	7	0	0
Carbon bisulphide	ton	50	0	0	to	52	0	0
Casein technical	ton	95	0	0	to	100	0	0
Cerium oxalate	lb.	0	3	0	to	0	3	6
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	6	0	to	0	6	6
Oxide, black	lb	0	9	6	to	0	10	0
Copper chloride	lb.	0	1	2	to	0	1	3
Sulphate	ton	27	10	0	to	28	10	0
Cream Tartar, 98–100%	ton	100	0	0	to	102	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde, 40% vol.	ton	90	0	0	to	95	0	0
Formusol (Rongalite)	lb.	0	2	6	to	0	2	9
Glauber salts, commercial	ton	5	0	0	to	5	10	0
Glycerin, crude	ton	65	0	0	to	67	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	4	to	0	2	5
Iron perchloride	ton	30	0	0	to	32	0	0
Iron sulphate (Copperas)	ton	3	10	0	to	4	0	0
Lead acetate, white	ton	43	0	0	to	45	0	0
Carbonate (White Lead)	ton	42	0	0	to	47	0	0
Nitrate	ton	44	10	0	to	45	0	0
Litharge	ton	35	10	0	to	36	0	0
Lithopone, 30%	ton	22	10	0	to	23	10	0
Magnesium chloride	ton	5	10	0	to	6	0	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	7	10	0	to	8	0	0
Sulphate (Druggists')	ton	10	0	0	to	11	0	0
Manganese Borate, commercial	ton	65	0	0	to	75	0	0
Sulphate	ton	60	0	0	to	62	0	0
Methyl acetone	ton	70	0	0	to	75	0	0
Alcohol, 1% acetone	ton	105	0	0	to	110	0	0
Nickel sulphate, single salt	ton	49	0	0	to	51	0	0
Ammonium sulphate, double salt	ton	51	0	0	to	52	0	0
Potash, Caustic	ton	32	0	0	to	33	0	0
Potassium bichromate	lb.	0	0	6	to	0	0	6½
Carbonate, 90%	ton	31	0	0	to	33	0	0
Chloride, 80%	ton	12	0	0	to	12	10	0
Chlorate	lb.	0	0	4½	to	0	0	5
Metabisulphite, 50–52%	ton	84	0	0	to	90	0	0
Nitrate, refined	ton	43	0	0	to	45	0	0
Permanganate	lb.	0	0	9	to	0	0	9½
Prussiate, red	lb.	0	4	6	to	0	4	9
Prussiate, yellow	lb	0	1	6½	to	0	1	7½
Sulphate, 90%	ton	13	0	0	to	13	10	0
Salammoniac, firsts	cwt.	3	3	0	to		—	
Seconds	cwt.	3	0	0	to		—	
Sodium acetate	ton	24	10	0	to	24	15	0
Arseniate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	4¾	to	0	0	5
Bisulphite 60–62%	ton	21	0	0	to	23	0	0
Chlorate	lb.	0	0	3¾	to	0	0	4
Caustic, 70%	ton	20	0	0	to	20	10	0
Caustic, 76%	ton	21	0	0	to	22	0	0
Hydrosulphite, powder, 85%	lb.	0	1	9	to	0	2	0
Hyposulphite, commercial	ton	10	10	0	to	12	0	0
Nitrite, 96–98%	ton	29	10	0	to	30	0	0
Phosphate, crystal	ton	16	0	0	to	16	10	0
Perborate	lb.	0	0	11	to	0	1	0
Prussiate	lb.	0	0	11½	to	0	1	0
Sulphide, crystals	ton	11	10	0	to	12	0	0
Sulphide, solid, 60–62%	ton	17	0	0	to	18	10	0
Sulphite, cryst.	ton	12	10	0	to	13	0	0
Strontium carbonate	ton	55	0	0	to	60	0	0
Strontium Nitrate	ton	40	0	0	to	42	0	0
Strontium Sulphate, white	ton	6	10	0	to	7	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Sulphur, Flowers	ton	11	0	0	to	12	0	0
Roll	ton	11	0	0	to	12	0	0
Tartar emetic	lb.	0	1	3	to	0	1	4
Theobromine	lb.	0	12	6	to	0	13	0
Tin perchloride, 33%	lb.	0	1	2	to	0	1	4
Perchloride, solid	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals)	lb.	0	1	5	to	0	1	6
Zinc chloride 102° Tw.	ton	21	0	0	to	22	10	0
Chloride, solid, 96–98%	ton	25	0	0	to	30	0	0
Oxide, 99%	ton	37	0	0	to	38	0	0
Dust, 90%	ton	45	0	0	to	47	10	0
Sulphate	ton	16	10	0	to	17	10	0

Pharmaceutical Chemicals

Acetyl salicylic acid	lb.	0	2	10	to	0	3	0
Acetanilid	lb.	0	1	4	to	0	1	6
Acid, Gallic, pure	lb.	0	3	0	to	0	3	3
Lactic, 1.21	lb.	0	2	9	to	0	3	0
Salicylic, B.P.	lb.	0	1	4	to	0	1	6
Tannic, leviss	lb.	0	3	4	to	0	3	6
Amidol	lb.	0	8	6	to	0	8	9
Amidopyrin	lb.	0	14	6	to	0	15	0
Ammon ichthosulphonate	lb.	0	2	0	to	0	2	3
Barbitone	lb.	0	12	0	to	0	13	0
Beta naphthol resublimed	lb.	0	1	9	to	0	2	0
Bromide of ammonia	lb.	0	0	8½	to	0	0	9
Potash	lb.	0	0	7½	to	0	0	8
Soda	lb.	0	0	8	to	0	0	8½
Caffeine, pure	lb.	0	12	0	to	0	12	3
Calcium glycerophosphate	lb.	0	5	6	to	0	6	0
Calcium lactate	lb.	0	2	0	to	0	2	3
Calomel	lb.	0	4	9	to	0	5	0
Chloral hydrate	lb.	0	4	3	to	0	4	6
Cocaine alkaloid	oz.	0	18	6	to	0	19	0
Cocain hydrochloride	oz.	0	14	6	to	0	15	0
Corrosive sublimate	lb.	0	4	6	to	0	4	9
Eucalyptus oil, B.P. (70–75% eucalyptol)	lb.	0	1	7	to	0	1	7½
B.P. (75–80% eucalyptol)	lb.	0	1	8	to	0	1	8½
Guaiacol carbonate	lb.	0	8	3	to	0	8	6
Liquid	lb.	0	9	0	to	0	9	6
Pure crystals	lb.	0	10	0	to	0	10	6
Hexamine	lb.	0	3	0	to	0	3	3
Hydroquinone	lb.	0	3	3	to	0	3	6
Lanoline anhydrous	lb.	0	0	7½	to	0	0	8
Lecithin ex ovo	lb.	0	18	6	to	1	0	0
Lithia carbonate	lb.	0	10	0	to	0	10	6
Methyl salicylate	lb.	0	2	1	to	0	2	3
Metol	b.	0	10	0	to	0	10	6
Milk sugar	cwt.	4	17	6	to	5	2	6
Paraldehyde	lb.	0	1	4	to	0	1	6
Phenacetin	lb.	0	4	10	to	0	5	0
Phenazone	lb.	0	6	9	to	0	7	0
Phenolphthalein	lb.	0	5	0	to	0	5	3
Potassium sulpho guaiacolate	lb.	0	5	0	to	0	5	3
Quinine sulphate, B.P.	oz.	0	2	3			—	
Resorcine, medicinal	lb.	0	5	9	to	0	6	0
Salicylate of soda powder	lb.	0	1	10	to	0	2	0
Crystals	lb.	0	2	0	to	0	2	3
Salol	lb.	0	2	1	to	0	2	4
Sulphonal	lb.	0	14	0	to	0	14	6
Terpene hydrate	lb.	0	1	9	to	0	2	0
Theobromine, pure	lb.	0	12	0	to	0	12	6
,, soda salicylate	lb.	0	8	6	to	0	9	0
Vanillin	lb.	1	5	0	to	1	6	6

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	2	3	to	0	2	6
Alphanaphthol, refined	lb.	0	2	9	to	0	3	0
Alphanaphthylamine	lb.	0	1	9	to	0	1	10
Aniline oil, drums extra	lb.	0	0	10	to	0	0	11
Aniline salts	lb.	0	0	10	to	0	0	11
Anthracene, 40–50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	3	3	to	0	3	6
Benzidine, base	lb.	0	5	0	to	0	5	3
Benzidine, sulphate	lb.	0	4	6	to	0	5	0
Benzoic acid	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol	lb.	0	1	4	to	0	1	4½
Betanaphthylamine, technical	lb.	0	4	6	to	0	5	0
Croceine Acid, 100% basis	lb.	0	3	3	to	0	3	6
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	3	9	to	0	4	0
Dinitrobenzol	lb.	0	1	1	to	0	1	2

	Per	£	s.	d.		£	s.	d.
Dinitrochlorbenzol	lb.	0	0	11	to	0	1	0
Dinitronaphthalene	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	4	to	0	1	5
Dinitrophenol	lb.	0	1	7	to	0	1	9
Dimethylaniline	lb.	0	2	6	to	0	2	9
Diphenylamine	lb.	0	4	0	to	0	4	3
H-Acid	lb.	0	5	6	to	0	6	0
Metaphenylenediamine	lb.	0	4	6	to	0	4	9
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	5	9	to	0	6	0
Metatoluylenediamine	lb.	0	4	6	to	0	4	9
Monosulphonic Acid (2.7)	lb.	0	5	6	to	0	6	0
Naphthionic acid, crude	lb.	0	2	6	to	0	2	9
Naphthionate of Soda	lb.	0	2	9	to	0	3	0
Naphthylamin-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Neville Winther Acid	lb.	0	7	9	to	0	8	0
Nitrobenzol	lb.	0	0	9	to	0	0	9½
Nitronaphthalene	lb.	0	1	2	to	0	1	3
Nitrotoluol	lb.	0	1	0	to	0	1	2
Orthoamidophenol, base	lb.	0	12	0	to	0	12	6
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	1	0	to	0	1	6
Orthonitrotoluol	lb.	0	0	6	to	0	0	8
Para-amidophenol, base	lb.	0	8	6	to	0	9	0
Para-amidophenol, hydrochlor	lb.	0	7	6	to	0	8	0
Paradichlorbenzol	lb.	0	0	6	to	0	0	7
Paranitraniline	lb.	0	3	3	to	0	3	6
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	5	0	to	0	5	3
Paraphenylenediamine, distilled	lb.	0	10	6	to	0	10	9
Paratoluidine	lb.	0	5	9	to	0	6	3
Phthalic anhydride	lb.	0	2	6	to	0	2	9
Resorcin, technical	lb.	0	4	6	to	0	5	0
Sulphanilic acid, crude	lb.	0	1	0	to	0	1	1
Tolidine, base	lb.	0	7	0	to	0	7	6
Tolidine, mixture	lb.	0	2	6	to	0	2	9

Essential Oils and Synthetics

(Prices supplied by Essences and Synthetics, Ltd.)

ESSENTIAL OILS

		£	s.	d.
Aniseed Star and Redship	c.i.f. price 1/11½	0	2	2
Bergamot	14/0 to	0	14	6
Bois de Rose female		0	10	6
Camphor white	per cwt.	4	5	6
Cassia 80–85%		0	8	9
Cedarwood		0	1	6
Cinnamon Ceylon leaf	per oz.	0	0	4½
Citronella Ceylon		0	2	5
Clove oil		0	6	0
Dill		0	13	0
Geranium Bourbon		1	6	0
Gingergrass		0	9	0
Lemon		0	3	0
Lime West Indian Distilled		0	2	0
Mandarin		0	16	0
Mint dementholised Kobayashi's or Suzuki's		0	8	6
Orange Sicilian		0	9	6
Parma rosa		0	16	0
Patchouli		1	17	6
Peppermint American		0	13	6
Petitgrain Paraguay		0	7	0
Sassafras		0	5	0
Spearmint		0	14	0

SYNTHETICS

Benzyl acetate	0	2	9
Benzyl benzoate	0	2	9
Linalol	0	19	6
Linalyl acetate	1	4	6
Terpeniol	0	3	0
Coumarine	0	11	0
Heliotropine	0	5	6
Ionone 100%	1	7	0
Geraniol Java	0	6	6
Geraniol Parma rosa	1	10	0
Rhodinol extra	2	10	0
Methyl salicylate	0	2	0
Citral	0	10	0
Musk xylol	0	10	6

The Manchester Chemical Market

(FROM OUR OWN CORRESPONDENT.)

Manchester, December 21, 1922.

THE chemical market during the past few days has experienced one of its periodical quiet phases, but in this case, in contrast to many other occasions during the year, the cause is chiefly seasonal. With lower contract prices asked for next year's delivery of some of the leading "heavies," orders for these products are reported on a satisfactory scale, and other lines also are being fairly well booked. Traders have a good volume of inquiries in hand from overseas account and it is expected that business will result from many of them.

Heavy Chemicals

Caustic soda is still in active inquiry both for home consumption and for shipment at from £18 per ton for 60-62 per cent. strength to £20 10s. for 76-77 per cent., delivered buyers' stations. Soda crystals are more active at £5 5s. to £5 10s. per ton delivered. The demand for bleaching powder continues; contract prices for next year's delivery are £10 10s. to £11 10s. per ton. Glauber salts are steady but only in moderate inquiry at £4 10s. per ton. Saltcake, also, keeps rather quiet at £4 10s. per ton. Sodium sulphide is easier at £16 10s. for 60-65 per cent. concentrated. Ammonia alkali is unchanged in position or value at £7 17s. 6d. per ton for 58 per cent. material. Bicarbonate of soda is in fair demand at £10 10s. per ton in 2-cwt. bags, carriage paid. Hyposulphite of soda is still inactive, and photographic crystals are again easier at £16, with commercial at £10 per ton. Nitrite of soda is rather quieter at £27 per ton. Phosphate of soda is now on offer at about £15 10s. per ton, with a rather better inquiry. Chlorate of soda is steady and in good demand at 3d. per lb. Prussiate of soda is still only a quiet section at 10¾d. per lb. Bichromate of soda is firm and in moderately active inquiry at 4½d. per lb. delivered. Acetate of soda is unchanged at £23 per ton, sellers meeting with a steady demand.

Caustic potash is easier at £28 per ton for 88-90 per cent. strength. Bichromate of potash is still quiet at 6d. per lb. Yellow prussiate of potash is in slightly better supply at 1s. 5¾d. per lb., with red still quoted at 4s. to 4s. 3d. Carbonate of potash is firmer at £29 10s. per ton for 96-98 per cent. material, a good trade being done in this product. Chlorate of potash is fairly active at 3¾d. per lb. Permanganate of potash remains very quiet at 7½d. per lb.

The position of sulphate of copper is unchanged, the home demand being very subdued though the export side is improving; about £26 10s. per ton f.o.b. is now quoted. Arsenic is still scarce and £70 to £75 per ton is asked for white powdered Cornish makes, the advance having apparently spent itself for the time being. Commercial Epsom salts are quiet but steady at £5 to £6 per ton. Acetate of lime, grey, is firmer at £16, with brown on offer at £8 per ton. Nitrate of lead is inactive at £42 per ton. White sugar of lead is also quiet at £38 and brown £34. Ammonium muriate, grey, is easier at £32 per ton. Alum is also cheaper at £12 10s. per ton for loose lump, delivered.

Acids and Tar Products

Tartaric and citric acids keep dull, the demand being very quiet; tartaric is unchanged at 1s. 1½d., while citric is now easier at 1s. 8d. per lb. for B.P. crystals. Acetic is in good demand and prices are firm at £65 for glacial, and £41 per ton for 80 per cent. technical. Oxalic acid is quiet and easier at 6¾d. per lb.

Little change from last week can be reported in the position of coal-tar products. Pitch is in good export inquiry and the prices are well maintained at round about £5 10s. per ton, f.o.b. Manchester, available supplies for prompt loading being scarce. Carbolic acid keeps firm, crystals at 8½d. per lb., and crude, 60 per cent. material, at 2s. 3d. to 2s. 6d. per gallon. Benzole is quiet at 1s. 8d. per gallon. Solvent naphtha is unchanged at 1s. 9d. to 1s. 10d. per gallon for 90-160, but comparatively little business is being put through. Creosote oil is firm at 7¼d. to 7½d. per gallon, with a steady inquiry for shipment. All grades of naphthalene keep firm at up to £7 per ton for crude, £17 for flake, and £15 per ton for crystals.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

GLASGOW, DECEMBER 20, 1922.

BUSINESS continues fairly quiet, and there is no change of importance to record.

Wood distillation products are in demand, and methyl alcohol is specially in short supply.

Industrial Chemicals

ACETONE.—Numerous inquiries are on the market, and further business has been done around £115 per ton, c.i.f. U.K.

ACID ACETIC.—Glacial, 98/100%, supplies scarce for spot delivery; quoted, £55 to £57 per ton, ex wharf, early shipment; 80% pure, £42 to £44 per ton; 80% technical, £39 to £40 per ton.

ACID BORACIC.—Crystal or granulated, £55 per ton; powdered, £57 per ton, carriage paid U.K. stations.

ACID CARBOLIC (ICE CRYSTALS).—Price about 8d. to 8½d. per lb., f.o.b. U.K.

ACID FORMIC, 85%.—Quoted £54 per ton, f.o.r.

ACID HYDROCHLORIC.—Price unchanged, 6s. 6d. per carboy, ex works.

ACID OXALIC.—In moderate demand. Quoted 7¼d. per lb., ex store.

ACID SULPHURIC.—Makers' prices unchanged; 144°, £4 per ton; 168°, £7 5s. per ton, in full loads, ex works; £1 per ton more for de-arsenicated quality.

ACID TARTARIC.—Crystals or powdered, 1s. 2d. per lb., ex store.

ALUM CHROME.—Quoted £26 per ton, f.o.b. for January shipment.

ALUM, LUMP POTASH.—In little demand. £13 per ton, ex store.

AMMONIA, ANHYDROUS.—Price, 1s. 6d. per lb., ex station.

AMMONIA, CARBONATE.—Lump, 4d. per lb.; ground, 4¼d. per lb., delivered.

AMMONIA, MURIATE.—Grey galvanisers quality, about £32 per ton, ex works; fine white crystals, £26 per ton, c.i.f.

AMMONIA SULPHATE.—25¼%, £15 per ton; 25¾%, neutral quality, £16 3s. per ton, ex works, December delivery.

ARSENIC, WHITE POWDER.—Spot lots hard to obtain. Quoted £63 per ton, January delivery.

BARIUM, CARBONATE 98/100%.—Continental offers of £14 per ton, c.i.f. U.K.

BARIUM, CHLORIDE.—98/100%.—Quoted £19 per ton.

BARYTES.—English makers' price unchanged, £5 5s. per ton, ex works, for finest white.

BLEACHING POWDER.—Price for spot lots, £12 15s. per ton, ex-station. Next year's price £11 10s. per ton, ex station.

BORAX.—Crystal or granulated, £28 per ton; powdered, £29 per ton, carriage paid U.K. stations.

CALCIUM CHLORIDE.—English make, £6 per ton, ex quay or station. Next year's price, £5 15s. per ton.

COPPER SULPHATE.—Good inquiry for export. Quoted £26 per ton, f.o.b. U.K. port.

COPPERAS GREEN.—Price £3 17s. 6d. per ton, ex works.

DEXTRINE.—Finest Dutch offered at £20 per ton, c.i.f.

FORMALDEHYDE, 40%.—Scarce for spot delivery. About £84 to £85 per ton.

GLAUBER SALTS.—Fine white crystals, £4 10s. per ton, ex store.

LEAD.—Red, £38 15s. per ton; white, £50 15s. Carriage paid U.K. stations in 5 ton lots. Continental red lead quoted £32 to £33 per ton, c.i.f. U.K.

LEAD NITRATE.—Moderate inquiry. Quoted £41 to £42 per ton, ex wharf.

MAGNESITE, GROUND CALCINED.—£7 to £10 per ton, ex store. In little demand.

MAGNESIUM CHLORIDE.—Spot material at £3 15s. to £4 per ton, ex store. Offered at £2 17s. 6d., c.i.f. U.K.

MAGNESIUM SULPHATE (Epsom Salts).—Commercial quality, £7 5s. B.P., £9 per ton, f.o.r.

POTASSIUM BICHROMATE.—Makers' price, 6d. per lb. delivered.

POTASSIUM CARBONATE, 88/92%.—In little demand. Spot material, £27 5s. per ton.

POTASSIUM CAUSTIC, 89/92%.—Price about £29 10s. per ton, ex store, spot delivery.

POTASSIUM CHLORATE.—Crystals or powder, 3½d. per lb.

POTASSIUM PERMANGANATE.—B.P. quality offered at 7⅛d. per lb., ex store.

POTASSIUM PRUSSIATE, YELLOW.—Quoted 1s. 6¼d. per lb. for spot delivery.

POTASSIUM SULPHATE, 90%.—About £13 10s. per ton, ex wharf.

SODIUM BICARBONATE.—Refined quality £10 10s. per ton, ex quay or station; m.w. quality, £1 per ton less.

SODIUM BICHROMATE.—English make 4½d. per lb. delivered.

SODIUM CARBONATE.—Soda crystals, £5 5s. to £5 10s. per ton, ex quay or station; Alkali, 58%, £9 2s. 6d. per ton, ex quay or station 5s. less January 1.

SODIUM CAUSTIC.—76/77%, £23 5s.; 70/72%, £21 5s.; 60/62%, £20 5s.; 98/99%, powdered, £26 15s. to £27 15s. per ton, ex station. Prices next year 25s. to 45s. less.

SODIUM HYPOSULPHITE.—Commercial quality £10 10s. per ton; pea crystals £17 per ton, ex station.

SODIUM NITRATE.—Refined 96/98%, about £12 10s. per ton.

SODIUM NITRITE.—Quoted £27 per ton, basis 100%.

SODIUM PRUSSIATE, YELLOW.—Now offered at 10¾d. per lb. ex store.

SODIUM SULPHATE (SALTCAKE 95%).—Price for home consumption, £4 per ton. Higher prices asked for export.

SODIUM SULPHIDE.—60/62% conc. offered at £14 15s. per ton, c.i.f. U.K.; 30/32% crystals about £8 10s. per ton, c.i.f. U.K.

SULPHUR.—Government surplus stocks still available £3 10s. to £3 15s. per ton, ex depot. Flowers, £11; roll, £10; rock, £9; ground, £9. Prices nominal. Little inquiry.

TIN CRYSTALS.—Unchanged at 1s. 2d. per lb.

ZINC SULPHATE.—Continnental material offered at £13 per ton, ex wharf.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

ALPHA NAPHTHYLAMINE.—Prices are lower. Supplies offered at 1s. 6½d. to 1s. 7¾d. per lb. delivered.

BENZALDEHYDE, DISTILLED.—Small home inquiry. Price quoted, 3s. 3d. per lb. delivered.

"G" SALT.—Export inquiry. Offered at 3s. 3d. per lb. 100% basis, f.o.b.

"H" ACID.—Home inquiry. Price quoted, 5s. 5d. per lb. 100% basis.

NAPHTHA, SOLVENT.—Supplies are offered at 1s. 9d. per gallon ex works, in returnable drums.

NAPHTHIONATE OF SODA.—Inquiries for home and export. Price quoted, 2s. 8½d. per lb. on 100% basis, delivered, or f.o.b.

NAPHTHIONIC ACID.—Offered at 2s. 8d. per lb. on 100% basis, carriage paid.

ORTHO DICHLORBENZENE, CRUDE.—Supplies are offered at £56 per ton delivered, drums extra, returnable.

PARA TOLUIDINE.—Home inquiry. Price quoted, 5s. per lb. delivered.

PHTHALIC ANHYDRIDE.—Home inquiry. Price quoted, 2s. 5d. per lb. delivered.

Tariff Changes

AUSTRALIA.—A revised method of valuation for Customs duty was described in the *Board of Trade Journal* of December 14, p. 683.

GREECE.—A translation revising the regulations regarding exchange transactions may be seen at the Tariff Section of the Department of Overseas Trade, 35, Old Queen Street, London.

CHINA.—The work of revising the specific duties in order to make them equivalent to an effective 5 per cent. *ad valorem*, has been completed and the proposed new tariff rates are given in the *Board of Trade Journal* of December 14, p. 685. A number of chemicals, dyes, pigments, oils, soaps, waxes, etc., are affected.

Company News

GOODLASS, WALL AND CO., LTD.—The transfer books are closed until December 30.

PREMIER PORTLAND CEMENT (RHODESIA).—An interim dividend of 10 per cent. has been declared.

NEW TRANSVAAL CHEMICAL CO.—It is announced that the transfer books will be closed until December 30.

SWEDISH MATCH CO.—It is reported from Stockholm that the company's new share issue of 45,000,000 kroner has been oversubscribed.

BROUGHTON COPPER CO.—An interim dividend at the rate of 5 per cent. per annum, less tax, on the ordinary shares for the half year was payable on Thursday.

ANGLO-AMERICAN OIL CO., LTD.—An interim dividend of 1s. per share will be paid on January 16 to holders of share warrants to bearer in exchange for coupon No. 24.

HARGREAVES BROTHERS AND CO., LTD.—An extraordinary general meeting of shareholders was convened for yesterday (Friday) to consider an agreement for the sale of the company's assets, but without transferring its liabilities.

EXPLOSIVES AND CHEMICAL PRODUCTS, LTD.—Holders of share warrants wishing to attend the seventeenth annual meeting, which will be held at Finsbury Pavement House on December 29, at 11.30 a.m., must deposit their warrants on or before December 27.

UNITED TURKEY RED CO.—It is announced that the dividend on the 4 per cent. first preference shares for the half-year to December 31 will be paid in January, but the directors have decided not to pay the dividend on the 5½ per cent. second preference shares for the half year to December 31.

PEACHEY PROCESS CO., LTD.—Presiding on December 14 at the annual meeting, Sir J. P. Hewett, M.P., said that a strong board for the proposed new manufacturing company had been formed. It was hoped quite soon to circulate full particulars of the projected company to shareholders.

BRITISH ALUMINIUM CO., LTD.—The transfer books of the 5 per cent. prior lien debentures are closed until December 31 for payment of interest due on January 1 next. Coupons attached to the debenture bonds to bearer are payable at the London County Westminster and Parr's Bank, 52, Threadneedle Street, London.

HUELVA COPPER AND SULPHUR MINES, LTD.—The eighteenth ordinary general meeting of the company will be held at 6, Old Jewry, London, on December 29, at 2.30 p.m. It is stated that the dividend cannot be paid until certain formalities required by the French Treasury are completed. No dividend can be paid on fractions of shares still outstanding.

SACCHARIN CORPORATION.—After writing down investments by £2,473 the net profit for the year to March 31 last was £6,467, converting the debit balance brought down into a credit of £4,155. It is proposed in the near future to submit a reorganisation scheme, which, if approved, will enable the directors to make a cash return and a substantial proportion of the preference capital.

RICHARD THOMAS AND CO., LTD.—Including dividends from subsidiary and other companies, the profit recorded in the report to September 30 last amounted to £384,945. After deducting all charges for depreciation, there remains a balance of £239,644, which, with £219,603 brought in, makes a total of £459,247. The preference dividend absorbs £240,713, leaving £218,534. The directors recommend a dividend at the rate of 6d. per share, less tax, on the ordinary shares, leaving £163,680 to be carried forward. The annual meeting will be held at the Central Hall, Westminster on December 20, at noon.

Stabilisation of the Austrian Exchange

WHILE the Austrian krone still stands at about 330,000 to the £, there is every reason to believe, states Mr. H. Wilson Harris in the *Daily News*, that stabilisation has been effected. He acknowledges that the rate is a fantastic one, but expresses the opinion that it does not matter in itself. A sudden recovery he continues, would cause almost as much chaos as another sudden slump. The exchange cannot move back towards the normal without injuring the export trade and increasing unemployment, but Mr. Harris points out that the only alternative to a return through suffering to healthy life is a short swift relapse into death. His conclusion is that Austria has adopted the sounder policy.

Science in the Rubber Industry

The Rôle of the Works Chemist

LECTURING on "Some Aspects of Science in the Rubber Industry," before a meeting of the Institute of Rubber Industry held at Birmingham on Wednesday, Mr. B. D. Porritt, F.I.C. (director of the Research Association of British Rubber and Tyre Manufacturers), said his impression was that, generally speaking, the works chemists and engineers' conception of their respective duties was to keep the existing plant, processes and products in smooth running order. In the rubber industry this was no light matter, and left little leisure for considering whether the methods or machinery themselves might be modified or improved. To the pressure of this onerous routine work must be ascribed in a measure the surprising fact that so little alteration had taken place in the technique of the industry since the time of Thomas Hancock.

He was convinced that the time had now arrived for a greater use of technical research in the works, and with the co-operation of the chemist, the engineer, and the accountant, a systematic attack might be made on many sources of wastage of power, steam, time and material, to which the methods of manufacture in the rubber industry specially lent themselves. The success of such efforts would depend to a great extent upon securing the assistance and support of the foremen and staff of the works, and in this connection he thought the time was approaching—if it had not already arrived—when a higher standard of education would be necessary for those entrusted with the supervisional work of the factory departments.

In this connection Mr. Porritt suggested that a series of popular lectures on rubber testing, for the benefit of the factory foremen, might be a profitable expenditure of time on the part of the chemist, and that provision for the future might be made by filling works vacancies, as they arose, from promising junior assistants engaged on routine testing in the laboratory.

In extending his sphere of usefulness, the chemist from now onwards would have to rely on another important ally—the physicist—whose presence had until recently been little in evidence in industrial laboratories. He thought he need only point to the recent work on X-rays and the effect of the particle size of compounding ingredients as a justification for this view.

The opportunities of the chemist, he continued, were not limited to the factory proper, since in both the purchase of raw materials and the sale of the finished article scientific and technical questions must arise from time to time. In a small works a close liaison between the chemist and the buyer and the sales manager respectively might be sufficient, but in a large business the presence of men with scientific and technical experience on the staffs of these commercial sections might enhance the efficiency of their work.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIAL.	REF. NO.
New Zealand ..	Druggists' sundries	670
Santiago de Chile	Paints, varnishes and painting requisites	D.O.T. 7204/ F.L./G.P.
Spain and Portugal	Sulphate of copper	662

Colouring of Metals

LECTURING before the Birmingham Section of the Society of Chemical Industry on Tuesday, Mr. A. E. Tucker gave demonstrations of new electrolytic processes for colouring metal. Specimens of iron, copper and brass articles were exhibited upon which apparently hitherto unknown oxides of extreme minuteness were formed.

THE BRITISH ALIZARINE COMPANY LTD.

Manchester London Glasgow

Manufacturers of Alizarine Dyestuffs

ALIZARINE RED (all shades)

ALIZARINE BLUES (soluble and insoluble)

ALIZARINE BORDEAUX

ALIZARINE CYANINE

ALIZARINE GREEN (soluble and insoluble)

ALIZARINE ORANGE

ALIZARINE RED S. POWDER

ALIZARINE BLUE BLACK

ALIZARINE (MADDER) LAKES (of all qualities)

ALIZARINE MAROON

ALIZUROL GREEN (Viridine)

ANTHRACENE BROWN

ALIZANTHRENE BLUE

ALIZANTHRENE BROWN

ALIZANTHRENE YELLOW

Other fast colours of this series in course of preparation

Anthraquinone, Silver Salt and all intermediates of this series

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CHROME TANNING and other Chrome Compounds

TELEPHONES
663 Trafford Park, MANCHESTER
860 EAST LONDON
2067 DOUGLAS, GLASGOW

TELEGRAMS:
BRITALIZ MANCHESTER
BRITALIZ LONDON
BRITALIZ GLASGOW

All communications should be addressed to

The British Alizarine Co., Ltd.
Trafford Park, Manchester

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BOULTON AND SKELTON, LTD., Grimsby, chemists. (M., 23/12/22.) Registered December 4, £2,000 debentures, present issue £200; general charge. *Nil. December 20, 1921.

FLEETWOOD CHEMICAL CO., LTD., London, S.E. (M., 23/12/22.) Registered December 4, £3,000 debentures, present issue £1,370; general charge.

MAYOUS, LTD., Birmingham, chemists. (M., 23/12/22.) Registered December 6, £350 debentures, present issue £125; general charge. *Nil. October 6, 1921.

ORMSIDE SILICA WORKS, LTD., Redhill. (M., 23/12/22.) Registered December 6, £1,000 further charge, to bank; charged on property comprised in mortgage dated August 4, 1922, and Holmthorp, Redhill.

TAYLORS' DRUG CO., LTD., Leeds. (M., 23/12/22.) Registered December 5, £763 mortgage, charged on 15, Shakespeare Street, Consett; also registered December 8, £500 mortgage, charged on 43, Hyde Road, West Gorton. *£66,168 16s. 2d. November 28, 1921.

TURNER DRUG AND GALENICAL CO., LTD., Ilford. (M., 23/12/22.) Registered December 1, £3,000 2nd debentures, present issue £1,000; general charge. *—. April 14, 1921.

London Gazette

Companies Winding-Up Voluntarily

STANDARD WOOD CHEMICALS CO., LTD. (C.W.U.V., 23/12/22.) M. C. Spencer, of Messrs. Price, Waterhouse and Co., appointed liquidator. Meeting of creditors at the offices of Messrs. Price, Waterhouse and Co., 3, Frederick's Place, Old Jewry, London, E.C.2, Friday, December 29, 1922, at 12 noon.

THE CANE WAX AND CHEMICAL CO., LTD. (C.W.U.V., 23/12/22.) Arthur Sissons, 65, London Wall, London, E.C.2, appointed liquidator. Meeting of creditors, 65, London Wall, London, E.C.2, Friday, December 29, 1922, at 12 noon.

Bankruptcy Information

KEEVILL, Donald Frank (separate estate), trading with Arthur Gordon Keevill, as Keevill, Webb, Fardon and Co., 39, Redcliff Street, Bristol, manufacturing chemist. Last day for receiving proofs, January 4, 1923. Trustee, F. W. Darley, Official Receiver, 26, Baldwin Street, Bristol.

Notices of Dividends

BUSH, Emil Frederick, 120, High Road, New Southgate, colour and chemical merchant. Amount per £, 5s. 3d. First and final. Payable, December 20, at the offices of Messrs. Saker and Davis, 28, Theobald's Road, W.C.1.

WILLIAMS, William Eleder, 12 High Street, Swansea, chemist and druggist. Amount per £, 2s. 11d. First and final. Payable, December 23, 1922, Official Receiver's Offices, Government Buildings, St. Mary's Street, Swansea.

Partnerships Dissolved

COHEN AND ROUSSO (Raphael Raoul COHEN and Salomon Henry ROUSSO), chemical and general merchants, 2, Talbot Court, Eastcheap, London, E.C.3, as and from December 1, 1922, by mutual consent.

THOMAS BELL (Mary BENSON and James Ormerod HARWOOD), chemists, Ambleside, Westmorland, from September 23, 1922, by mutual consent. Debts received and paid by J. O. Harwood, who will continue the business.

New Companies Registered

WILLIAM BAILEY (CHELTENHAM), LTD., Six Chimneys Lane, Lower Alstone, Cheltenham. Soap makers, tanners, dealers in animal products, etc. Nominal capital, £3,000 in £1 shares.

DE PASS FERTILISERS, LTD. Fertiliser manufacturers, oil refiners, manufacturers and rectifiers of sulphuric acid and sulphate of ammonia, etc. Nominal capital, £25,000 in £1 shares. A subscriber: F. C. Leaver, 40a, Holdenby Road, Brockley, S.E.

DENT, SONS, AND CO., LTD., St. James's Buildings, Cambridge Street, Harrogate. Tar distillers, manufacturers of and dealers in coke, tar, ammoniacal liquor, sulphate of ammonia, etc. Nominal capital, £20,000 in £1 shares.

ESSEX FERTILISERS, LTD., 57, Basinghall Street, London, E.C. Manufacturers of and dealers in artificial manures, chemicals, vitriols, nitrates, etc. Nominal capital £200 in £1 shares.

INDUSTRIAL RESEARCH, LTD. To adopt an agreement with Studiengesellschaft für Ausbau der Industrie relating to any inventions, processes, schemes, etc., to use, exercise, develop, and grant licences in respect of any such inventions etc. Nominal capital, £15,000 in £1 shares (6,000 6 per cent. cumulative participating preference). A subscriber: F. L. Gilmour, 32, Essex Street, Strand, London, W.C.2.

JOHN C. STEELE AND CO., LTD., 16, Victoria Street, Glasgow. Wholesale, retail, and manufacturing chemists, drysalters, etc. Nominal capital, £2,500 in £1 shares.

STRAHEARN MANURE WORKS, LTD. Manure manufacturers. Nominal capital, £15,000 in £1 shares. A subscriber: J. D. Hay, Glencarn, Bridge of Earn.

Oxidation of Nitric Oxide

In the course of a paper on "The Velocity of Oxidation of Nitric Oxide, and its importance in Nitrogen Fixation," read on December 14 before the Chemical and Physical Section at Armstrong College, Newcastle-on-Tyne, Professor G. W. Todd said the rate at which nitric oxide was converted into the peroxide under varying conditions of concentration and temperature was of the utmost importance in nitrogen fixation and nitric acid manufacture. In arc processes nitric oxide was synthesised at high temperature and subsequently oxidised at lower temperatures. In ammonia oxidation processes, nitric oxide was formed at about 500° C., the temperature depending on the catalyst used, and was oxidised by the addition of "secondary air." In the Häusser process, the nitric oxide was produced by exploding a mixture of illuminating gas and air, with or without the addition of oxygen, the resulting products being cooled rapidly by sudden expansion to prevent the dissociation of the nitric oxide.

Professor Todd dealt with the mathematics of these reactions and showed how it was possible to obtain general expressions for the time of oxidation of nitric oxide, applicable to all posible conditions of working.

Mr. S. P. Owen, M.Sc., read a paper on "A Simple Derivation of Van de Vaal's vapour pressure equation, with a note on molecular diameters."

Awards for Wartime Chemical Inventions

An appendix to the second report of the Royal Commission on Awards to Inventors, of which Sir William Pearce and Mr. A. Chaston Chapman are members, contains the following awards: The Coslett Anti-Rust Syndicate, Ltd., anti-rust process, £300; Mr. B. Lambert, lime permanganate granules, £12,500; Mons. le Capitaine Berger, smoke producing apparatus, £1,800; Mons. Jules Verdier, smoke producing apparatus, £1,800; Messrs. T. M. and W. Thomson, improvements in the manufacture of nitro cellulose, nil; Major W. C. Ball, introduction of cellulose wool in respirators, nil; Professor W. R. Hodgkinson, incendiary shell, £2,000; Professor H. B. Baker, anti-gas apparatus, nil; and a process of elimination of poisons from drinking water, nil; Lt.-Col. Craig, Sir Robert Robertson, Dr. R. C. Farmer, Dr. G. Rotter, manufacture of T.N.T., nil; Mr. C. E. Stuart, electro deposition of iron, adjourned with liberty to restore.